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Engineering and Mining Journal

McGraw-Hill Publishing Co., Inc., New York

Lovely Figures That Never Lie

1916	ORDINARY SHOVELS
Men employed (Average)	7700
Shovel Bill	$17,227.51

1917	RED EDGE SHOVELS
Men employed (Average)	9500
Shovel Bill	$11,900.00

(Sufficient shovels on hand to last until February, 1918)

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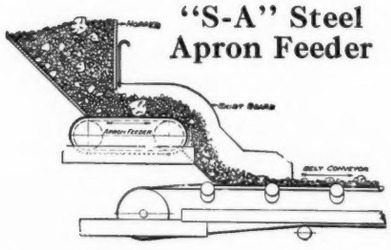

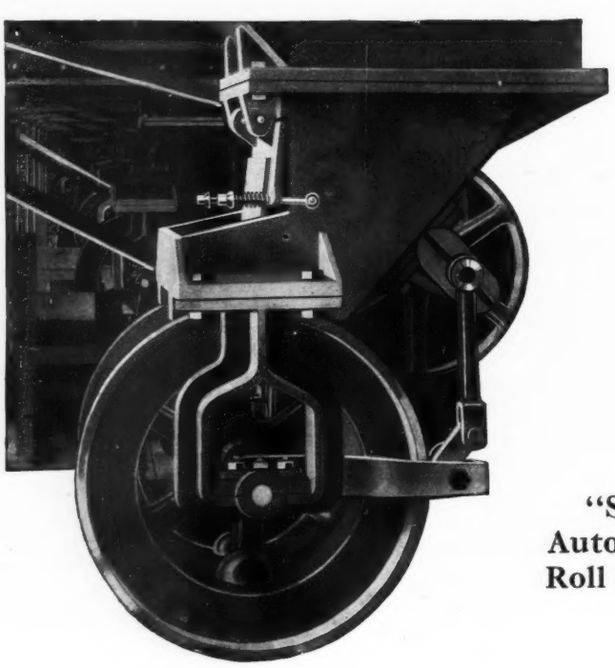

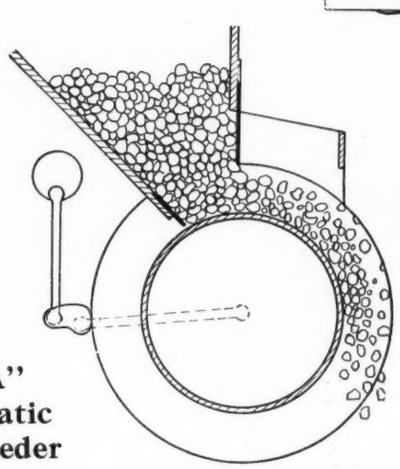

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Engineering and Mining Journal

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Reconstruction of Hydraulic-Power Canal for Ecuador Gold Mine

BY PAUL C. SCHRAPS*

The reconstruction of a section of the hydraulic-power canal, spillway, penstock and closed conduits, without interruption to the operation of the existing power plant; an outline of operating conditions in Ecuador and a well segregated cost sheet are described in considerable detail.

IN CONNECTION with the construction of the South American Development Co.'s new cyanide plant in the Zaruma district of Ecuador, it became necessary to reconstruct part of the hydraulic-power canal, spillway and conduits at Portovelo. This company operates a gold mine in southern Ecuador, in the foothills of the Andes, about two days' ride from the coast. The town adjacent to the mine is called Portovelo. Zaruma, the head of the Canton of Zaruma, which includes Portovelo, lies a few miles distant.

LOCAL CONDITIONS AFFECTING OPERATIONS

A brief description of some of the difficulties attending the supply of labor and the delivery of materials, etc., may be of interest. Except for lumber and staple foods, practically all supplies are shipped from the outside, chiefly from the United States. Shipment from New York is made by boat to Puerto Bolivar, a small port on the east side of the Gulf of Guayaquil, thence by small craft to Santa Rosa, a town lying some distance up a small river, thence by muleback to the mine, about 45 miles over an exceedingly bad trail. All heavy machinery is sectionalized when possible to 100 lb. or less. All bulk material is put up in packages as nearly as possible to 100 lb. in weight, the standard mule load being 200 lb. Convenient freight can be moved over the trail in good weather for about 1c. per lb. Heavy and awkward pieces cost much more, and during the rainy season all freighting brings a higher price. The average charge for transportation from New York to the mine, covering all expenses, lies between $85 and $95 a ton.

Native labor has become fairly skillful after years of training. Untrained peons get one *sucre* a day, a *sucre* amounting to 48.7c. in U. S. currency. Carpenters range up to 3.50 *sucres* a day. The average wage of all company employees, exclusive of staff, during 1916, was 1.72 *sucres* ($0.84) per shift. To the wage must be added the cost of the free meals which the company provides, which averaged 0.2867 *sucres* ($0.14) per shift per man in 1916.

The company uses water power altogether, the stamp mill and main hoist being driven direct, and compressed air and electric current are similarly generated. A counter-current decantation plant is being built to replace amalgamation and sand leaching, and this, as noted in the following report, involved reconstructing that part of the water-power installation lying between the new plant and the old stamp mill. To carry out this work with the minimum of interruption to operations, and without accident, was a consideration of first importance.

FIG. 1. VIEW SHOWING RELATION OF DIVERSION CANAL TO THE EARTHEN CANAL

*Construction engineer, South American Development Co., Apartado 655, Guayaquil, Ecuador.

Referring to Fig. 2, it may be seen that at the edge of the new millsite was the earthen canal which supplied water to two 36-in. steel pipes; the latter delivered the water under 40-ft. head to Pelton wheels driving four 10 x 16-in., sectionalized, quadruplex air compressors. The canal also supplied water through two 18-in. steel pipes, for operating two Peltons, one of which was directly connected to a small air compressor and the other to the leaching-plant line shaft.

The earthen canal passed through the site of the new cyanide plant, and the new tank floor was to be 21 ft. below the bottom of the canal. The two 36-in. steel pipes furnishing water to the compressor-plant Pelton wheels also passed over the new cyanide-plant location and would have to be moved unless other conduits were provided for delivering water to the Peltons. It was decided to replace the earthen canal, spillway, penstocks and steel pipes with concrete structures.

The drawing, Fig. 2, also shows the relationship between the old and new hydraulic plants. It will be seen that the position of the new concrete canal is practically unchanged from that of the old canal; this condition introduced the problem of delivering the water to the 36-in. pipes during the reconstruction period otherwise than through the earthen canal. Emptying into the earthen canal were the water discharge from the stamp-mill Pelton wheel and the discharge from the electric-plant turbine. This water could have been run to waste but in the dry season it is necessary to conserve water for power purposes. The new conduit, a concrete tube, had to be constructed without interfering with the 36-in. steel pipes, and provision for changing over the flow to the concrete tube had to be accomplished with a minimum loss of time.

It was the intention to start excavation and construction work on both the new cyanide and the hydraulic plant simultaneously; but the shortage of materials made it necessary to hold back construction of the cyanide plant until completion of the hydraulic plant. It was decided, however, to excavate as much as possible for the new cyanide plant. Another factor that influenced the delay in construction was the shortage of skilled labor.

Temporary Diversion Canal Provided Water Power During Construction

The solution of the problem of construction was as follows: For delivering water to the 36-in. pipes a temporary diversion canal was used. This was excavated south of the earthen canal and at such a distance as to provide safe banks and at the same time be as close as possible in order not to interfere with the new cyanide-plant excavation. The intake of the diversion canal was placed as far east, that is upstream, as possible in order not to interfere with the construction of the new canal spillway and sand trap.

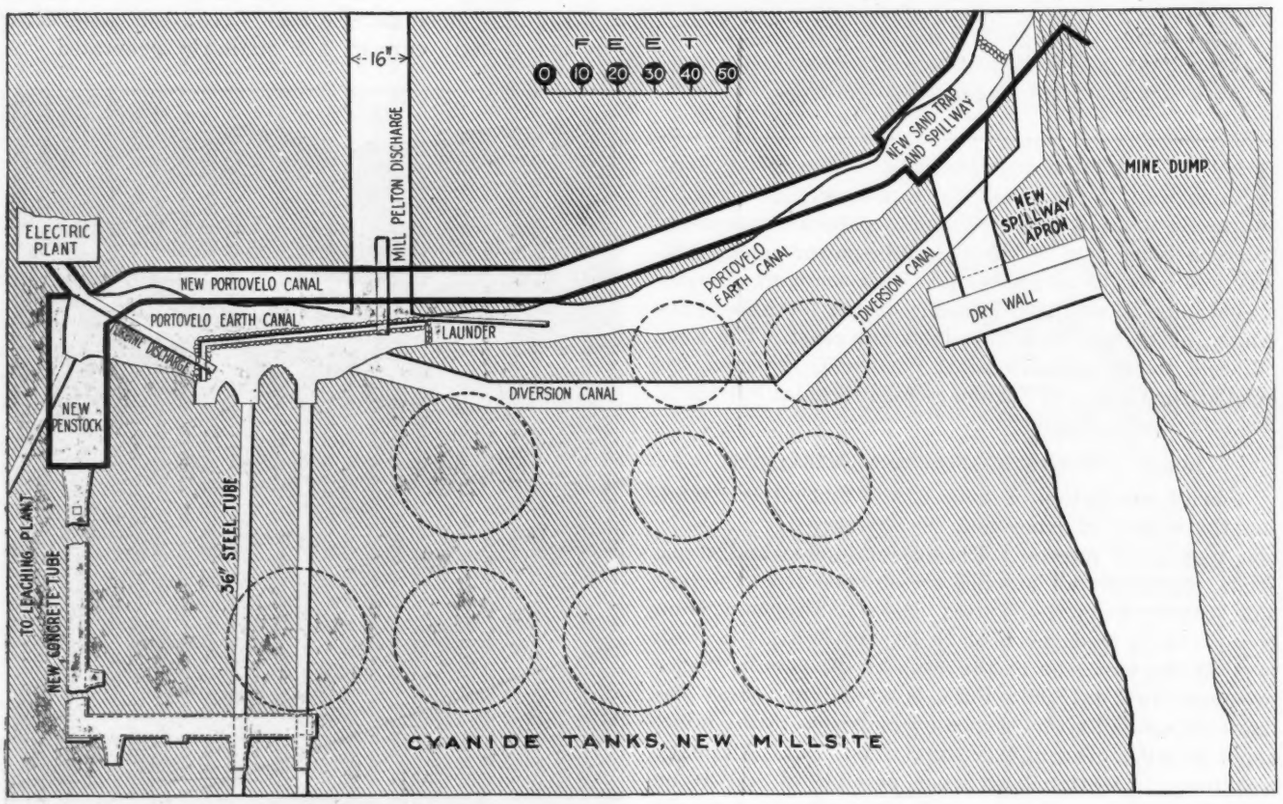

FIG. 2. GENERAL PLAN SHOWING RELATION OF OLD AND NEW WORKS

At the steel-pipe penstocks a cofferdam was built to reduce the cross section of the earthen canal to a minimum and thus allow space for the construction of the new canal at this point. The water from the stamp-mill Pelton wheel was carried in a flume from the discharge apron, over the new canal site, to the side of the cofferdam toward the compressors. Likewise the water discharge from the electric plant was carried to the side of the cofferdam.

It was desired that the new plant should have sufficient capacity to supply power easily for operating up to eight Pelton wheels for driving the existing and

future compressor, a Pelton wheel for operating an auxiliary stamp-mill rope drive, and a possible installation of a Pelton wheel for an accumulated-slimes plant.

For continuous operation it was necessary to consider the flood waters of the rainy season and the great amount of débris brought down the canal during the first few months of that season. With the old plant considerable attention was required to keep the grizzlies open; the Pelton wheels and buckets were continually breaking and the nozzles had to be cleaned regularly.

Fig. 5 shows the general design of the sand trap and spillway; the spillway area is sufficient to handle any excessive quantity of water that may flow through the intake canal during the rainy season. The overflow area, controlled by the flashboards, is such that the boards may be set to give the proper speed to the Pelton wheels, and at the same time the decreased overflow area is sufficient to take care of the daily water-level fluctuations. The "step up" from the bottom of the sand trap to the bottom of the canal prevents part of the sand and stones from entering the canal, and the underflow sluice affords means of flushing out the accumulated débris.

Fig. 3 shows a section of the new canal. The design was made upon the assumption that there would be no back fill and that the vibration of the walls, due to the stamp mills and tube mills, would be considerable.

The details of design of the concrete tube are shown in Figs. 6 and 7. At the tube-header junction it was desired to curve the tube but, for various reasons, this was not practicable. In designing the header it was decided to make the center line intersect at right angles the center line of the 36-in. steel pipes. This meant that is was necessary for the header to be built around the steel pipes. For changing the flow of water from the steel pipes to the concrete tube, steel bulkheads were inserted in the header around the steel pipes.

It was planned that when everything was ready for making the change, the steel pipes were to be emptied and then cut, first where they entered the header and then inside of the concrete neck leading therefrom; pieces of pipe, cut as long as possible, were to be taken out. The plate or head was then to be bolted to the bulkhead ring and the water turned into the new plant. This plan was carried out when the time for the change over came.[1] The tube is 189 ft. long and has an inclination of 10° 20′. The header is horizontal and 68.75 ft. long.

Excavating Diversion Canal by Sluicing

Excavating for the diversion canal was started Mar. 1, and finished Mar. 16, 1916. Most of the excavating was done with water from two 2-in. nozzles working under a head of 150 ft. The material moved was a clayey gravel containing boulders as large as 2 ft. in diameter. Fig. 4 shows a section of the lining of the diversion canal. A lining was used on account of the new cyanide-plant excavation, which was to extend as near the canal as possible. The placing of the canal lining was started Mar. 16 and finished, with the exception of the two sets at either end, Mar. 26. An earth dam was left at each end of the diversion canal so that the water in the earth canal would not interfere with the work.

The length of the diversion canal was roughly 238 ft. The grade was the same as that of the earth canal,

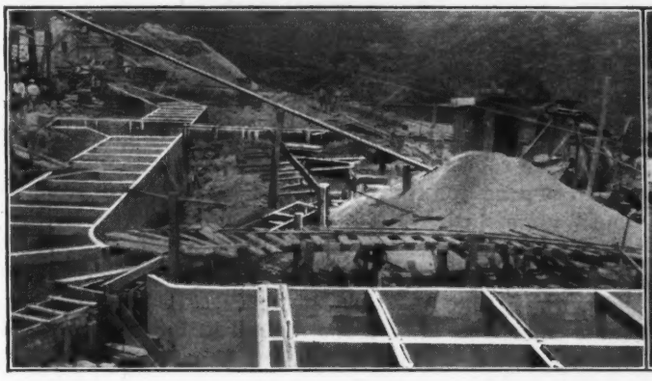

FIG. 3. CONSTRUCTING THE NEW CONCRETE CANAL

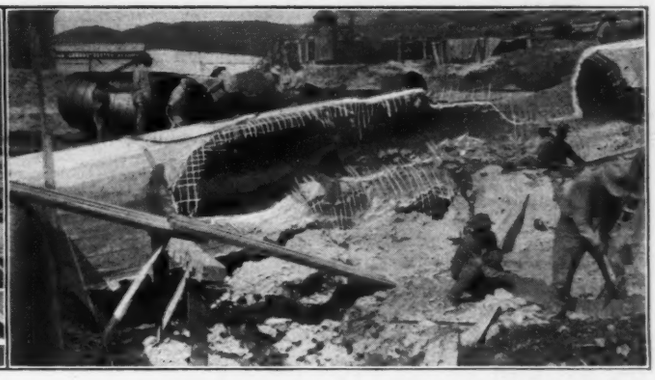

FIG. 7. VIEW SHOWING EFFECT OF RUPTURE IN TUBE

The grade of the canal is 0.2%. The elevations are determined by the elevation of the discharge apron of the stamp mill.

Penstock Has Two Independent Compartments

In the design of the penstock, provision was made to have a storage capacity sufficient to give a constant head of water to the compressor-plant Peltons; to divert all stones, sand and leaves that might pass the sand trap; to clean readily all débris accumulated; and to control the water so that the tube might be emptied. The water first passes through grizzlies and then through four 3 x 5-ft. gates. The penstock is divided into two compartments, each of which may be operated independently, and each compartment is controlled by two of the 3 x 5-ft. gates. At the tube end of these compartments there are walls, 5 ft. high, over which the sand and stones must pass to enter the tube; at the foot of these walls are two 18-in. gates—one in each compartment—which open to an 18-in. underflow sluice for flushing out the débris collected.

[1]At the time the concrete tube was put into commission and the steel pipes were cut off an examination was made of the two 36-in. pipes which supplied the four most easterly compressor Peltons. The more easterly of these two pipes was in by far the worse condition. This was apparently made of 11-gage sheet, U. S. standard, equivalent to 0.125 in. The westerly was of 8 gage, 0.172 in. The easterly pipe, if ever galvanized, had lost all its coating; it had worn and rusted thin, was easily cut and could have lasted only a little while longer. The westerly pipe had its galvanizing on the outside almost intact; on the inside the galvanizing was gone in places and the steel had pitted at these points. The pipe, however, was in excellent condition generally, and could have lasted many years longer. The steel in this pipe was reported by the master mechanic as of the highest quality. The easterly pipe was probably 20 years old, the westerly about 11 to 12 years.

0.2%. The minimum cross section of the earth canal was 21 sq.ft. and that of the diversion canal 31.5 sq.ft. On Mar. 26 the diversion canal was ready for the water and the change was made on that day. The water was shut off from the earth canal; the dams at each end were taken out and the last few sections of the lining were placed in position. In the earth canal, dams of sand bags and rock were placed so as to exclude the water from that part of the canal that was paralleled by the diversion canal. Fig. 2 shows the position of the diversion canal. After the diversion canal was in operation the cofferdam was built and then all the water was drained out of the earth canal.

Excavating for the permanent canal was started Apr. 15 and finished May 5. The excavating was done in a manner similar to that of the diversion canal. The class of material moved was the same. Vertical banks of this ground, 15 ft. high, stand without support as long as they are kept dry. After the canal excavation was almost completed, excavating was started for the sand trap and spillway. There was not much material to be moved at this point. This work was started May 5 and finished in 10 days.

Placing the forms for the concrete lining of the sand trap was started May 25 and finished June 13. They were made as panels; 2 x 4-in. material was used in the frames and the facing was of 1-in. material. These panels were bolted to vertical members of 2 x 4-in. material spaced every 2 ft. Pouring of concrete in the sand-trap forms was started June 19 and finished June 22. The operation was intermittent; about sixty batches of concrete being sent to the forms daily.

The reinforcement in the sand trap consists of old pipe and angle bars bent to an angle of 90°, one side 8 ft. long and the other 2 ft. long. The long side was placed in the floor and the short turned up into the wall. These pieces were staggered and spaced at 12-in. centers. All old pipe used was first flattened. The sand trap forms were removed June 26, and those for the canal were then placed in position.

The canal forms were made as panels; 2 x 4-in. material was used for the frame and 1-in. boards for the facing. These forms were made interchangeable as far as possible and were arranged to be bolted to the vertical members of 2 x 4-in. material. The inside forms were 10 ft. long and 6 ft. 2 in. high. The circular forms at the connection between floor and walls were made of ribs of 1-in. material cut to the proper radius and faced with 1 x ½-in. strips. Outside forms were 10 ft. long and 8 ft. high. Placing of the canal forms started June 13 and was finished July 17. The total length of the canal is 232 ft. Enough forms were made to pour about 50 ft. at each setting.

The reinforcement in the canal consists of old pipe, flattened, and angle bars of the same dimensions as those used in the sand trap and placed in the same manner. In the south canal wall above the cyanide-plant agitator No. 1, reinforcement was inserted as follows: Three lengths of cable, each 35 ft. long, were placed in the wall as horizontal bars, spaced about 2 ft. apart, and to the cables were tied old rails as vertical members; the rails were spaced at 3-ft. centers.

The construction of the penstock was carried on in two sections on account of the proximity of the electric-plant building, a concrete structure, the foundations of which are not as deep as the foundation for the penstock. Referring to Fig. 2 it will be noted that the new canal passes directly in front of the electric building, the minimum distance from the electric building to the north wall of the canal being only 5 ft. Where the canal empties into the penstock there is a drop of 5 ft., and this point is 17 ft. from the electric building. The ground excavated at this point was soft and running, necessitating spiling.

The first penstock section extended from the tube junction to the point where the water drops from the canal into the penstock. Excavation was started May 17 and finished June 20. The placing of the forms began July 17, the canal forms being employed. By Sept. 1 all concrete work on the penstock was finished.

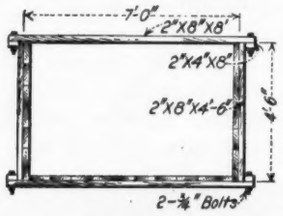

FIG. 4. SECTION OF THE DIVERSION CANAL

Excavating for the header and tube started Mar. 10 and was finished Apr. 28. Placing of forms began May 2, and the tube-header construction was finished July 25. The first forms were set at the junction of the header and tube and then advanced in both directions. Blaw collapsible steel forms being on hand, were used in this construction for the lower part of the tube, and 1-in. boards, cut into chords of the proper radius and faced with 1-in. strips, were used for the upper forms. Using the steel forms in this manner doubled the number available for each setting. The pouring of the header was divided into four parts, the piers, the center rib, the part around the lower steel forms and the part around the upper forms. The center rib along the center line of the piers was poured to such a height that the inside forms could rest upon it. Anchor bars were placed in the rib at specified distances; to the anchor bars were tied longitudinal bars, and then the bars that passed around the tube were tied to the longitudinal bars.

DISTRIBUTION OF CONCRETE-CANAL CONCRETE COSTS

Job	Supplies	Labor	Pro Rata Supplies	Pro Rata Labor	Total Supplies	Total Labor	Per Cent. of Total Supplies	Per Cent. of Total Labor
Forms[4]	$445 41	$885.92			$445.41	$885.92	$9.44	$18.78
Sand and gravel[1]	.21	25.04	$158.96	$231.27	158.96	255.61	3.37	5.41
Cement[3]	2,050 20	.....	.....	.....	2,050.20	.....	43.46	.....
Reinforcement	134.66	161.73	.....	.....	134.66	161.73	2.85	3.43
Mixing and pouring[2]	4.60	347.16	88.52	18.08	93.12	365.24	1.97	7.74
Transportation	29.42	137.16	.....	.....	29.42	137.16	.62	3.91
Total			.....	.....	$2,914.99	$1,805.35	$61.71	$38.27

[1] The pro-rata costs under "sand and gravel" include one-half of the first cost of the screening plant.
[2] The pro-rata costs under "mixing and pouring" include one-half of the first cost of the mixer.
[3] Cement costs, in Portovelo, $12.39 per barrel.
[4] Lumber costs, $52.60 per thousand.

COST OF RECONSTRUCTION, PORTOVELO CANAL*

General Expense	General Expense Supplies	Labor	Total
Supervision and engineering	.....	$954.28	$954.28
Tools and general construction eqpt	$592.25	55.05	647.30
Sluice boxes	3.50	63.63	67.13
Trommel and bins	537.82	718.06	1,255.88
Elevator and frame	12.50	17.04	29.53
Concrete mixer	310.31	64.97	375.28
Machine shop and pro rata	22.99	233.01	256.00
Carpenter shop and pro rata	147.35	189.73	337.08
Watchmen	4.96	273.63	278.59
Clearing, wrecking, changing operating equipment	228.33	370.37	598.70
Total	.....	.....	$4,799.77
Diversion Canal:			
Excavating and filling	27.91	348.47	376.38
Dams	2.48	48.25	50.73
Flume construction	31.35	534.70	566.05
Lumber	964.91	88.81	1,053.72
Hardware	86.68	20.09	106.77
Total	.....	.....	$2,153.66
New Concrete Canal:			
Excavating and filling	46.04	801.50	847.54
Forms	445.42	885.92	1,331.34
Sand and gravel	.21	24.03	24.24
Cement	2,050.20	.....	2,050.20
Reinforcement	134.66	161.73	296.39
Mixing and pouring	4.60	347.16	351.76
Transportation	29.41	137.16	166.57
Dams	7.05	92.13	99.18
Rock walls	.46	30.85	31.31
Total	.....	.....	$5,198.55
Sand Trap and Spillway:			
Excavating and filling	63.03	348.46	411.49
Forms	387.56	396.66	784.02
Sand and gravel	.05	6.96	7.01
Cement	1,044.03	.....	1,044.03
Reinforcement	28.90	3.14	32.04
Mixing and pouring	1.65	209.29	210.94
Transportation	107.02	47.24	154.26
Finishing	1.29	.....	1.29
Dams	26.11	14.49	40.60
Rock walls	30.32	268.45	298.77
Hardware	21.43	.....	21.43
Iron and steel	39.01	373.92	412.93
Total	.....	.....	$3,418.86
Penstock:			
Excavating and filling	$54.10	$585.05	$639.15
Forms	290.25	722.46	1,012.71
Sand and gravel	.31	23.26	23.57
Cement	1,627.78	.....	1,627.78
Reinforcement	169.44	121.67	291.11
Mixing and pouring	4.12	279.03	283.15
Transportation	1.87	67.95	69.82
Dams	2.36	31.29	33.65
Rock walls	.86	59.56	60.42
Hardware	19.01	.....	19.01
Iron and steel	325.93	91.25	418.18
Total	.....	.....	$4,478.59
Compressor Tube:			
Excavating and filling	10.07	247.05	257.12
Forms	345.78	453.01	798.79
Sand and gravel	.17	12.02	12.19
Cement	2,170.15	1.40	2,171.55
Reinforcement	178.32	206.06	384.38
Mixing and pouring	6.73	299.13	305.86
Transportation	8.07	187.27	195.34
Finishing	39.15	.....	39.15
Rock walls	.02	1.66	1.68
Hardware	108.05	.....	108.05
Iron and steel	7.91	.....	7.91
Total	.....	.....	$4,282.02
Compressor-Tube Header:			
Excavating and filling	3.77	86.38	90.15
Forms	258.46	622.75	881.21
Sand and gravel	.51	17.48	17.99
Cement	1,413.62	3.50	1,417.12
Reinforcement	183.09	158.95	342.04
Mixing and pouring	2.85	186.38	189.23
Transportation	4.18	86.53	90.71
Finishing	.....	19.90	19.90
Rock walls	1.97	124.02	125.99
Hardware	260.07	.....	260.07
Iron and steel	20.19	233.51	253.70
Total	.....	.....	$3,687.77
Compressor-Tube Reconstruction:			
Excavating and filling	9.32	201.89	211.21
Forms	81.72	180.12	261.83
Cement	1,109.98	.....	1,109.98
Reinforcement	33.90	30.69	64.59
Mixing and pouring	7.37	71.17	78.54
Transportation	.....	33.57	33.57
Dams	.....	22.62	22.62
Rock walls	.....	156.35	156.35
Hardware	134.18	.....	134.18
Iron and steel	629.37	407.42	1,036.79
Changing operating equipment	43.68	9.69	53.37
Total	.....	.....	$3,163.03
Grand total of charges to Portovelo Canal reconstruction	$17,006.06	$14,175.92	$31,181.98

* Cost has been converted into U. S. currency on the basis of one sucre equaling 48.7c., the normal rate of exchange for the Ecuadorian monetary unit.

The same scheme of pouring and placing of forms was practiced with the tube, but the reinforcement was not spaced according to specifications, which called for ½-in. bars placed in the tube at distances between centers ranging from 3 in. at the bottom to 12 in. at the top of the tube. Instead of the bars being set around the tube helically, as specified, anchor bars were set in the center rib on 12-in. centers for the entire length of the tube and projecting 18 in. on each side; to the anchor bars were tied longitudinal bars and to these were fastened the bars passing around the tube.

All concrete work involved in the Portovelo canal reconstruction, with the exceptions of the wing walls and discharge apron of the sand trap, was finished Sept. 1, but the plant was not tested out until Sept. 30. The method of testing was to fill the concrete tube and header with water diverted from the electric-plant draft-tube discharge.

The first test showed that the tube and header were porous. To remedy this feature the inside surface of the concrete was given a finishing coat at the porous

FIG. 5. VIEW OF SAND TRAP AND SPILLWAY

spots with a rich mixture of sand and cement. A second test of the tube showed that the finishing process was not satisfactory, so the whole surface was given one coat of coal-tar paint. The completed plant was put in operation the night of Nov. 12, and ran for three hours, when the concrete tube failed.

Failure of Concrete Tube and Its Redesign

An inspection of the tube, Fig. 7, showed that from a point 2 ft. north of the header to a point 10 ft. north of the auxiliary mill-drive feeder, the east side of the tube was torn out. The auxiliary mill-drive feeder fell away from the tube as one piece. Reinforcing bars that tied the feeder to the tube extended from the top and bottom of the tube and not, as specified, clear around the tube. The tube-header junction was intact, though the lower part of the tube had moved out from the center rib, showing a side of the rib as smooth as a board, indicating that there had been no bond. The anchor bars in the center rib failed. In the interior of the tube two cracks along the bottom, corresponding with the sides of the center rib, could be seen, and the more easterly, along which the failure occurred, extended for a distance of about 40 ft. up the tube from the header.

To repair the damage quickly and permanently the following scheme was decided upon: Sheet steel happened to be available so punched and in such sections as to make up a pipe 56 in. in diameter and the required length of 73 ft. This was made up into sectional lengths of about 15 ft. The first section was worked up into the tube through the break to such a distance as to make room for the second section; which was then riveted to the first. This procedure was followed until the whole pipe line was finished, after which it was slipped back so that the lower end reached the tube-header junction. Before the steel pipe had been slipped into the concrete tube, crossbars were imbedded in the lower part of the latter. These bars facilitated the moving of the steel pipe in the tube. After the steel pipe was in the proper position a concrete jacket was poured around the outside.

COST OF EXCAVATIONS

Job	Cu.Yd.	Per Cu. Yd. Supplies	Labor	Total
Concrete canal	1,097.63	$0.041	$0.730	$0.77
Sand trap and spillway	202.36	.313	1.743	2.05
Penstock	447.00	.121	1.309	1.44
Compressor tube	272.43	.037	.968	.94
Compressor-tube header	169.91	.026	.508	.53
Diversion canal	787.69	.035	.442	.48

To supply water to the compressor-plant Peltons while the tube reconstruction was going on, a bulkhead of concrete with timber braces behind was placed in the header a few feet east of the most westerly Pelton feeder. The 36-in. pipes were connected to the header steel bulkheads so as to deliver water from the diversion canal to the header. Soon after the tube and header were finished, circumferential cracks developed. To strengthen the tube at these points, reinforced-concrete buttresses were placed on both sides and tied across the top of the tube. The repair to the tube was made in 26 days. The whole plant was again in operation on Dec. 8 and has operated satisfactorily since.

The concrete plant consists of a rock-screening equipment and a No. 3 Ransome mixer. Fig. 2 shows the situation of the screening equipment with reference to that of the hydraulic plant. The rock, taken from the mine dump, consisted principally of andesite. It was screened to three sizes in a 3 x 8-ft. Allis-Chalmers trommel, which was set up over two bins. The first screen on the trommel was sheet steel punched with ⅜-in. holes. Material passed through this screen was classed as sand. The second screen was punched with holes of 1-in. diameter; the oversize from the trommel passed over a 2-in. grizzly.

COST OF CONCRETE

Job	Cu.Yd.	Per Cu.Yd. Supplies	Labor	Pro Rata Supplies	Labor	Total Supplies	Labor	Total
Concrete canal	128	$20.83	$12.17	$1.93	$1.81	$22.77	$13.98	$36.75
Sand trap and spillway	67	23.39	9.95	1.93	1.81	25.32	11.76	37.08
Penstock	76	27.41	15.88	1.89	1.75	29.27	17.63	46.90
Compressor tube	105	26.28	11.07	1.88	1.73	28.18	12.81	40.99
Compressor-tube header	74	25.09	14.75	1.91	1.77	27.01	16.52	43.53

So long as the mine dump was high enough to allow the material to be carried by water through a launder to the trommel, the scheme for washing the material was to discharge it from the launder into a box. This box had ends sloping at 30 deg. and was set on a platform in front of the trommel at such a distance that the material could be shoveled directly into the trommel. Where the dirty water overflowed, clean water from a hose was played on the material as it entered the trommel. All the dirty water was not eliminated but if it was allowed to remain in the sand bin the slime settled, which was undesirable. To eliminate this, holes were bored in one side of the sand bin to allow the water to escape.

After the mine dump had been lowered to a point where the material could not be run into the box on the platform at the trommel elevation a single-strand chain elevator was installed on the mine-dump side of the trommel. The material was shoveled into a launder carrying water which discharged directly into the boot of the elevator. This worked satisfactorily. The concrete mixer has a capacity of 8 cu.ft. per batch and 7 batches per hour. The mixer gave entire satisfaction. In the time—one year—that the machine was in operation no repairs were made.

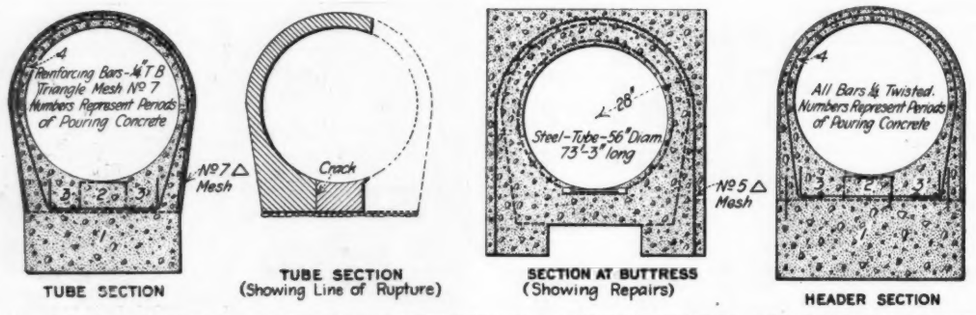

FIG. 6. TUBE SECTIONS, SHOWING CONSTRUCTION, REINFORCEMENT AND LINE OF RUPTURE

Ferromanganese Supplies

Manganese ore imports for the fiscal year ended June 30 are reported by the Department of Commerce at 492,860 tons in 1915-1916, and 656,088 tons in 1916-1917, an increase of 163,228 tons, or 33.1%. This is by far the heaviest quantity ever reported. The production of ferromanganese and spiegeleisen for the eight months to Sept. 1, as shown by the blast-furnace reports, was 288,993 tons, with the make increasing each month, so that the total for the year will probably be about 440,000 tons. Allowing for the low-grade spiegeleisen, this would be equivalent to about 280,000 tons of ferromanganese, carrying 80% manganese. As our requirements on the present steel output are estimated at 336,000 tons yearly, this would leave only 56,000 tons to be imported, at least a part of which will be offset by the increased make here. The imports of ore, as above reported, with the still moderate domestic production, will supply sufficient raw material for all the ferromanganese that will be made.

Domestic Potash Production

Stoppage of foreign supplies of potash raised prices and not only permitted but necessitated the development of domestic resources. Largest output was secured from natural brines in Nebraska, Utah and California. Alunite deposits in Utah yielded high-grade potassium sulphate. In the aggregate considerable potash was obtained from sugar-factory wastes and from wood ashes. Blast-furnace dust and that from cement kilns furnish important quantities of potash, some plants selling high-grade salts. Experimental work continues with processes to extract potash from feldspar and other silicate rocks. Further search for natural deposits was carried on by Government and by private interests.

A SHORTAGE of potash salts was felt in the United States practically at the outbreak of the war, in 1914; after the German government placed an embargo on the export of potash salts, Jan. 30, 1915, all available markets of the world were searched for potash stocks, largely of German origin. As these sources began to fail, the domestic demands at times carried the price of potash to a high figure. Such a condition of affairs gave to the search for domestic sources of potash a stimulus greater than ever before. Hoyt S. Gale has prepared a comprehensive review[1] of the situation, describing the methods used in 1916 for extracting potash from natural deposits and from residues of certain manufactures.

Principal Uses of Potash

Most of the potash consumed in the United States is used as fertilizer. For certain manufacturing industries potash is an important item, and for some explosives it is absolutely necessary. It is used extensively in the manufacture of matches. Soap makers use caustic potash for the best soaps, though caustic soda can be employed for the common grades. Practically all the liquid soaps, shaving soaps and shampoo preparations require at least some potash. A hydrated potassium carbonate is used in the manufacture of glass, and in normal times about 3000 short tons, valued at about $250,000, has been imported for making the higher grades of glass. The tanning and dyeing industries require potash, largely as bichromate and ferricyanide. In metallurgy potassium cyanide is used for leaching gold and silver ores, but sodium cyanide will serve. Minor amounts of potash are used in electroplating, in photography, in medicines and in miscellaneous chemical compounds.

Natural deposits of saline material usually consist largely of sodium salts, but probably every such deposit of salt, brine or saline water contains at least a small percentage of potash. Many samples have been sent to Government offices for analysis and, as is often the case in the mining industry, optimists believe that a small percentage at the surface indicates rich deposits at depth. Ordinary sea water contains about 3½% of dissolved salts and an average of about 0.04% potash (K_2O). Under ordinary conditions it is not profitable to extract the potash from sea water. Where salt plants are established to recover sodium chloride from sea water, potash may be profitably recovered as a byproduct. A summary of the potash production in the United States in 1916—about 35,739 tons of 27% average K_2O content—has already been published in the *Journal*[2], in tabular form. The following notes review the principal sources of our present domestic production, sketching briefly the recovery methods used in 1916 in the United States.

Nebraska Furnished Largest Output

Alkali lakes in western Nebraska furnished the largest output of domestic potash in 1916. Investigation of these deposits was commenced in about 1911, and commercial operation was undertaken about the middle of 1915 by the Potash Products Co., of Omaha, Neb. From Jesse Lake, in Secs. 25 and 26, T. 25 N., R. 46 W., brine is pumped and conveyed by a 3-mile pipe line to the plant at Hoffland, on the Chicago, Burlington & Quincy Ry., where the water is evaporated and the salts are dried for shipment without refining. The lake is shallow and the bottom is composed of greenish mud, beneath which is sand charged with brine. In October, 1916, about 200 wells were being pumped, yielding brine reported to contain 19.32% of solids in solution. An analysis of the solids showed: K_2O, 30.85%; Na_2O, 25.31%; SO_3, 13.77%; CO_2, 19.79%; HCO_2, 7.74%; and Cl, 4.07%. The evaporated salts are mostly sulphates. The Hord Alkali Products Co. and the Palmer Alkali Co. operate near Lakeside, Neb.; and in 1916, the American Potash Co. and the Nebraska Potash Works Co. projected the building of plants at Antioch.

Searles Lake a Producer

The Searles Lake deposit, in southeastern California, was reported as being brought to the producing stage in 1916. This so-called lake, described[3] in detail by Mr. Gale, is practically dry during the greater part of the year. In the central part of the ancient-lake basin is a crust of crystallized salts, averaging 60 to 75 ft. in thickness. The crust reaches a maximum thickness of about 100 ft., but is thin at the edges, where it extends far under the surface of a marginal mud zone. The brine that permeates the deposit is a saturated solution that contains more potash than the crystallized salts. The combination of brine, salts and mud makes the deposit dangerous and difficult to work. A plan for pumping the brine promised to give the best results; but methods for separating the constituents, giving good results in the laboratory, were not entirely successful when tried on a commercial scale. Analysis of the salts in the brine shows: KCl, 4.02%; $Na_2B_4O_7$ (borax), 1.08%; Na_2CO_3, 4.26%; Na_2SO_4, 6.40%; and NaCl, 17.18%. The American Trona Corporation (its subsidiary is the California Trona Co.) erected an evaporat-

[1] "Potash in 1916," "Mineral Resources of the United States, 1916," Part 2, pp. 73-171.

[2] "The Potash Situation in United States," p. 1015, June 9, 1917.

[3] "Salines in the Owens, Searles and Panamint Basins, Southeastern California," Bull. 580, U. S. Geol. Surv., pp. 251-323, 1915.

ing plant at Trona and a refinery at San Pedro, Calif., to be in operation in 1916. The plant at Trona is said to be capable of treating 400,000 gal. of brine per day. It is believed that the brine is simply evaporated, the first crystals consisting chiefly of NaCl. Crude salts have been marketed, and also a high-grade potassium chloride, 98% pure. When in full operation, the refinery is to have a capacity of about 200 tons of potash and 60 or more tons of borax per day.

Another potash enterprise at Searles Lake is under the joint management of the Pacific Coast Borax Co. and the Solvay Process Co. at Borosolvay. Work on the first commercial unit was commenced in October, 1916, and it was to be placed in operation about Apr. 1, 1917. It was reported, in newspapers, that the output of the preliminary unit would be about 40 tons per day of a 60 to 70% KCl product, the intention being ultimately to increase the standard to 85 or 90 per cent.

Potash from Great Salt Lake

Two establishments have been built in Utah for recovering potash salts from Great Salt Lake. The water of Great Salt Lake carries about 20% of dissolved salts and analysis of the constituents shows: KCl, 3.16%; NaCl, 75.91%; $MgCl_2$, 10.92%; Na_2SO_4, 9.52%; $CaSO_4$, 0.34%; and $CaCO_3$, 0.15%. The Utah Chemical Co., allied with the Virginia-Carolina Chemical Co., has a plant near Saltair and treats the "mother liquors" from the salt works of the Inland Crystal Salt Co., containing about 2.5% of K_2O. The liquor is evaporated first in open vats and, later, by artificial heat, under cover. The liquor throws down a crop of crystals, mostly NaCl and Na_2SO_4, which is discarded. The liquor is then passed to a multiple-effect evaporating system, fitted with salt traps to remove as much NaCl as possible before the potassium chloride is thrown down. The final product, a mixture of $MgCl_2$, NaCl and KCl, carrying about 9 to 12% K_2O, is dried and sacked for shipment.

The Salt Lake Chemical Co., a subsidiary of the Diamond Match Co., has a plant near Grants station on the Western Pacific R.R. Brine is pumped directly from Great Salt Lake to large vats covering about 300 acres. After concentration by natural evaporation, with deposition of NaCl and some Na_2SO_4, the residual bittern contains about 4% or more of K_2O. This liquor is concentrated in artificial evaporators, the process apparently consisting mainly or entirely of evaporation of the liquor and crystallization of the salts. The first shipment of product was made at the end of 1916.

Salduro Salt Marsh, at Salduro station, on the Western Pacific R.R., in Utah, was staked in salt claims and worked by the Monticello Salt Co. Later the property was leased to the Capell Salt Co. and finally taken over by the Solvay Process Co. The deposit resembles that of Searles Lake, but the salt mass is only 3 to 5 ft. in depth, overlying a saline mud of unknown depth. The crystallized salt contains only a little potash. The brine is more saturated than the water of Great Salt Lake, containing about 27.07% of dissolved salts, analysis of which shows: KCl, 7.03%; NaCl, 81.04%; $MgCl_2$, 9.07%; Na_2SO_4, 1.98%; and $CaSO_4$, 0.88%. The deposit was described in the *Journal*[4] as a possible source of potash. The erection of a plant was commenced in the latter part of 1916.

Production of potash salts is reported by the Whitney Chemical Co. from residues of salt-refining works at San Mateo, Calif., and attention is called to the possibility of producing potash from the "spent liquors" obtained by the separation of soda at Owens Lake, Calif., and at salt works in various parts of the country.

Alunite a Promising Source

The production of potash from alunite was maintained at Marysvale, Utah, by the Mineral Products Corporation during the greater part of the year. Owing to the destruction of the mine equipment by fire in October, 1916,[5] the property was shut down from Nov. 1 until the end of the year. The alunite is obtained from the Gillan-Custer claims in the high mountains southwest of Marysvale and is delivered by an aërial tram to wagons in Little Cottonwood Canyon, whence it is hauled about 3½ miles to the mill, which is about five miles southwest of Marysvale. The Utah Potash Co. conducted experimental work at Sigurd, about 36 miles north of Marysvale. The Florence Mining and Milling Co., controlling claims to the north of the Gillan-Custer group, built a mill and calcining furnace about one mile south of Marysvale, but made no output in 1916. Several companies have been formed to operate alunite deposits near Marysvale, and some exploration work was undertaken. The discovery of alunite was also reported from several localities in Nevada, California, Arizona, Colorado and Texas. Recent U. S. patents for reducing alunite were: No. 1,161,239, Nov. 23, 1916, to G. S. Morgan; No. 1,175,439, Mar. 14, 1916, to C. F. Hagedorn; No. 1,189,254, July 4, 1916, to P. R. Hershman and Raymond Cooke; No. 1,191,104, July 11, 1916, to P. R. Hershman; No. 1,195,655, Aug. 22, 1916, to H. F. Chappell. The Chappell process is used by the Mineral Products Corporation. The ore is crushed to about ¼-in. size and passed slowly through a rotary kiln at about 750° C. The roasted alunite is then digested for several hours with boiling water and filtered through Kelly presses. The cake, consisting mainly of alumina, is stored for possible later use. The filtrate is treated in a multiple-effect evaporator and a product of 95% K_2SO_4, practically free of chlorine, is obtained by crystallization. The ore treated at this plant averages about 8 to 9% potash.

Potash in Feldspar and Other Silicates

Potash is a constituent of certain feldspar and other silicate minerals, widely distributed in nature. Volcanic rocks often contain high percentages, a sample of tailings from a mill in the Cripple Creek district, Colo., showing 12.08% K_2O. A long list is given of patents granted for processes of extracting potash from silicates, as well as a bibliography of literature on the subject. In 1916 experimental work along this line was conducted by the Kaolin Products Corporation at Jonespoint, N. Y.; by the Waverly Chemical Co. at Camden, N. J.; by the Atlantic Potash Co. at Northampton, Penn.; by the Electric Smelting and Aluminum Co. at Sewaren, N. J. and at Lockport, N. Y.; and by various others.

[4] "Potash in Salduro Salt Deposit," Hoyt S. Gale, pp. 780-782, Oct. 28, 1916.

[5] A dispatch from Salt Lake City, dated Oct. 26, 1917, stated that a fire of mysterious origin, preceded by an explosion, destroyed the potash plant of the Mineral Products Corporation at Alunite, Utah, causing a loss estimated at $250.000.—Editor.]

The American Potash Co. of Denver, Colo., which proposes to extract potash from the Leucite Hills, near Rock Springs, Wyo., reported little progress in 1916. The leucite rock carries from 8.5 to 10% K_2O and processes for working it have been described by A. H. Rogers.[6]

Much potash is now obtained from the dust of blast furnaces and cement kilns, the former source having been described in the *Journal*[7] in abstract form. The Bethlehem Steel Co. has sold at a good profit the potash-bearing flue dust that settles from its blast-furnace gases, representing less than 2% of the total potash charged into the furnaces. Several cement companies obtain potash salts as byproducts. The Riverside Portland Cement Co. of Riverside, Calif., leaches potash-bearing dust with hot water and produces high-grade salts carrying 80% potassium sulphate.

Pacific Coast Kelp Industry

In 1916, nine companies produced potash and potash fertilizer from kelp. Near San Diego, Calif., are the works of the Hercules Powder Co., Swift & Co. and the Kelp Products Co. Near Long Beach, Calif., are those of the Lorned Manufacturing Co., the Sea Products Co., the Pacific Products Co. of California, and the National Kelp Potash Co. The Diamond Match Co. extracts potash at Wilmington, Calif., and the National Potash and Iodine Co. has a plant at Fort Stanley, Wash. Fifteen other plants were announced as being under construction, or contemplated, in California, Oregon and Washington, but none of them reported production in 1916. An interesting suggestion has been made[8] to exploit the seaweed of the Sargasso Sea for its potash content. The weed, when dried, is said to yield about 9% K_2O. Suggestions have also been made to utilize the weed, of the Sargasso type, that accumulates on the coasts of the Bahama Islands.

Various processes are used in the United States for recovering potash from kelp. The products are: Dried kelp, ground for use in fertilizer; ground "char" or ash of kelp; and refined KCl and K_2SO_4. At the Hercules Powder Co. plant, at Chula Vista, Calif., the kelp is cut from beds off San Diego Harbor and brought to the plant in barges. After maceration, and the addition of water and lime, the kelp is allowed to ferment in tanks having an aggregate capacity of about 12,000,000 gal. By temperature control and aeration the kelp is decomposed without putrefaction, and, after a week or more, fermentation is stopped by heating to the boiling point. Acetic acid, formed in the fermentation, unites with the lime, and potash and soda go into solution mostly as chlorides. The coarser fragments of kelp leaf, mainly cellulose but containing about 4% KCl, are screened out and reserved for possible future treatment. The solution is settled and clarified. Clear liquor is drawn off and the sludge filtered. The solid residue is treated for its potash content and the solution, with about 4 to 5% of dissolved salts, is concentrated in multiple-effect evaporators, further concentrated in open boiling tanks and finally run into crystallizers. By alternate hot and cold treatment a mixture of sodium and potassium salts is crystallized out, most of the acetate remaining in solution. The chloride salts are redissolved and refined by hot and cold treatment and fractional crystallization until a product of 90% KCl is obtained. It is planned to convert the acetates to acetone by a special process. The capacity of the plant is estimated as 20 tons, or more, of potash per day.

Wood Ashes, Distillery Waste and Miscellaneous Sources of Potash

The old method of extraction from wood ashes, responsible for the name of potash, is still practiced to some extent. In 1850 there were 509 establishments, in the United States, that produced from wood ashes a quantity of potash valued at $1,401,533. Due to the abundant supply of cheap salts from Germany, in 1905 there were reported only 39 establishments, the product of which was valued at $104,655. For 1916 the reported production was about 825 tons, valued at $270,000; from 27 firms in Michigan, 14 in Wisconsin, two or three in Maine and one in Ohio.

The potash produced in 1916 from refuse of beet- and cane-sugar manufacture, mainly waste from distilleries that produce alcohol from molasses, was valued at $500,000. A large plant at New Orleans, La., was reported as producing at the rate of 3000 lb. (K_2O) per day as potassium chloride. The Western Grain and Sugar Products Co. at Agnew, Calif., produced salts carrying 40% of K_2O at the rate of 700 short tons per month at the close of 1916. The entire output was used as fertilizer. Other plants operated at Harvey, La., near Boston, Mass., and at Bay City, Mich.

Ground tobacco stems carry 5 to 6% K_2O, and a small amount of chloride salts has been made from them, but they are generally dried and used as an ingredient of fertilizer. Their nitrogen content has a value and they also serve as a "drier" to absorb the excess moisture of other ingredients. Some potash is recovered from the washings of wool factories, notably at Lawrence, Mass., where the Diamond Match Co. has produced some potassium chloride for its needs. Australian wool is said to give a larger yield than domestic wool.

Activity of producers is increasing, but when prices fall, many will be forced out of business. Investigations by the Government and by private interests continue and it is hoped that this country can be made independent of foreign supplies through the discovery of deposits that can be exploited so as to compete on equal terms with foreign producers. Drilling has been conducted, particularly in northwestern Texas and southeastern New Mexico, with the view of ascertaining whether the salt beds contain appreciable quantities of potash. It is noted that deposits of potash have been found in the Permian in central Germany, in the Oligocene (Tertiary) in Alsace, in the lower Miocene (Tertiary) in Galicia, and in the supposed Eocene or Oligocene (Tertiary) in northeastern Spain, everywhere accompanied by deposits of common salt, dolomite and gypsum, and there seems to be no valid reason why similar deposits should not eventually be found in the United States.

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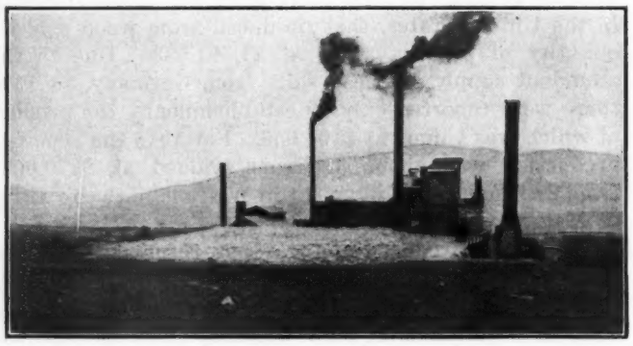
[6] "Met. and Chem. Eng.," p. 387, June, 1915.
[7] "Potash from Blast Furnaces," p. 176, Jan. 27, 1917.
[8] "Manufacturers' Record," Nov. 30, 1916.

Consumption of Black Blasting Powder in the United States in 1916 amounted to over 8,600,000 kegs of 25 lb. each. Of this amount, metal and coal mining consumed 7,392,000 kegs, the remainder being used in other operations.

Alunite Potash Plants in Utah

SALT LAKE CORRESPONDENCE

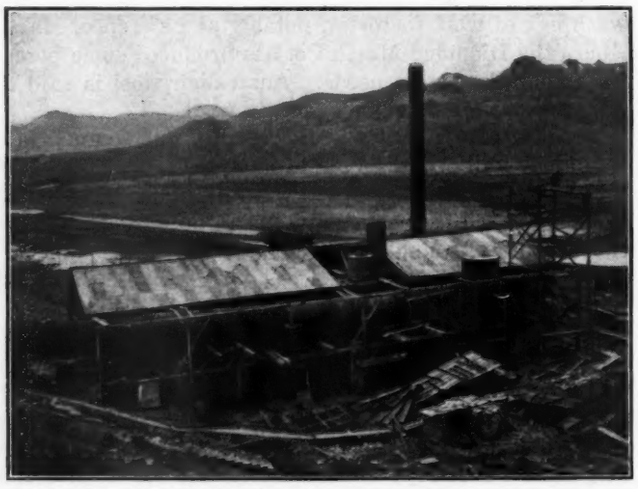
The potash plant of the Mineral Products Corporation at Alunite, six miles west of Marysvale in Piute County, Utah, was destroyed by a fire starting at six o'clock on the evening of Oct. 25, 1917. The fire originated in the coal drier, and was preceded by an explosion. A fire-fighting crew was quickly organized among the employees and inhabitants of the town of Alunite, but there was difficulty in getting a sufficient supply of



ALUNITE POTASH PLANT OF MINERAL PRODUCTS CORPORATION, NEAR MARYSVALE, PIUTE COUNTY, UTAH

Partly destroyed by fire, Oct. 25, 1917. Roaster stack on right, power stacks on left and center. Crushing plant, in right foreground, not damaged. This view, taken in April, 1917, shows 9000 tons of alunite in stock pile.

water on the buildings. The main mill building—in which were installed a part of the calciner, the digesters, evaporators, and the sacking and loading department for the potassium sulphate—was completely burned. The accounting office, general manager's office, laboratory, garage, and crusher plant were saved. The loss—according to officials of the company—is placed



ALUNITE CALCINING PLANT OF FLORENCE MINING AND MILLING CO., NEAR MARYSVALE, UTAH

Under construction in April, 1917; calciner in foreground. This plant is now working three shifts and is reported to be shipping up to six carloads of calcined alunite per week.

at about $250,000; which, however, may be reduced $50,000 by the salvage of the calciner, digesters, and possibly the evaporators. Only the rear end of the calciner was connected with the main mill building, and this can undoubtedly be put in repair. Two stokers, who were working at the coal drier and rear end of the calciner before the explosion, were severely burned.

During last May and June there were seven fires of mysterious origin, and the company had built a fence around the entire plant. The plant was the first successfully operated potash mill in the United States, producing high-grade potassium sulphate. The ore is alunite—hydrous sulphate of alumina and potash—and the plant has handled up to 175 tons of this material daily. The Armours, of Chicago, and the United States Smelting, Refining and Mining Co. are interested in the Minerals Products Corporation. John W. Hornsey is consulting chemist, and Howard S. Chappell president of the corporation. About 250 men are employed in and around the mill, which has been working three shifts. The plant will undoubtedly be rebuilt.

Special Mining Regiment

The Engineer Corps of the United States Army has been authorized to raise by voluntary enlistment a special mining regiment, to consist of six companies of 250 men each and to be known as the 27th Engineers, National Army. As announced in the *Journal* of Nov. 3, this regiment is now being recruited. The first company has been formed and is in training at Camp Meade, Md. The regiment will be made up entirely of picked men from the various mining sections of the country. All trades and occupations in and around a mine will be represented, and each company will have a sufficient number of men skilled in each trade to enable it to operate as a unit.

The work to be done is purely military in character and what is known as "first-line" work. It consists of the preparation of underground shelters for the fighting troops and the placing of explosive mines. This requires a high degree of skill in rapid tunnel construction and involves the handling of all sorts of material, from clay and chalk to hard rock. In addition to the regular engineer equipment, each company will be provided with special tools, such as tunneling and boring machines, drills, compressors, hoists, lighting sets, etc. While most of the work of the 27th Engineers will be underground mining, the regiment will be trained to fight as well as to mine. The commanding officer will be a regular army engineer officer, the remaining officers being drawn largely from the mining engineers who have volunteered their services and who have been given the necessary military training at the Officers' Training Camps. All men who volunteer for this service will be enlisted as privates, but those who prove qualified will be made non-commissioned officers. Any recruiting officer will enlist men for this regiment, but each man must show proper qualifications by way of experience and pass the usual physical examination. All men between the ages of 18 and 41 are eligible for enlistment, if not actually drawn on the draft. The 27th Engineers offers a great opportunity for the miners of this country to show their skill and courage. Any experienced mining man who wants first-line service in France is urged to enlist at once.

Experienced miners, both hand and machine drillers, muckers, trammers, timbermen, tracklayers, pumpmen, hoistmen, blacksmiths and tool sharpeners, electricians, machinists, carpenters, surveyors, timekeepers, cooks, shift bosses, mine foremen and topmen, are needed in this special mining regiment.

The personnel of a company is shown in the accompanying table, which also gives the rates of pay. After a man has enlisted he is clothed, fed, sheltered and transported at Government expense. He also receives free medical and surgical attention. Pay as shown in the table is practically clear money. Those who "want in" should go to the nearest recruiting office and enlist for the 27th Engineers, Camp Meade, Md. If unable to enlist in this regiment at the nearest recruiting office, one may mail an application to the Commanding Officer, 27th Engineers, Office of the Chief of Engineers, Washington, D. C. The application should be made out in the following form, beginning each new item on a separate line: Date; name; age; address, street and number, city and state; occupation or trade; present position; number of years' experience; schooling; do you speak or read French or German?; are you subject to draft?; have you been drafted?; give present address; have you been refused enlistment in any branch of the Army?; if so, why and when?; signature.

PERSONNEL OF COMPANY OF SPECIAL MINING REGIMENT AND RATES OF PAY

	In Each Company	Monthly Pay of Each When Abroad
First Sergeant	1	$60.00
Sergeant, first class	4	60.00
Supply Sergeant	1	51.20
Mess Sergeant	1	51.20
Stable Sergeant	1	51.20
Sergeant	10	51.20
Corporal	20	40.80
Horseshoer	1	44.00
Saddler	1	40.20
Wagoner	5	40.20
Cook	5	44.00
Bugler	2	33.00
Private, first class	66	36.60
Private	132	33.00
Total	250	
Battalion Headquarters		
Master Engineer, senior grade	2	96.00
Master Engineer, junior grade	4	84.00
Battalion Sergeant Major	1	60.00
Battalion Supply Sergeant	1	60.00

A complementary regiment of quarrymen, to be designated the 28th Engineers, will also be organized by voluntary enlistment.

Clifton-Morenci Strike Settled

The strike in the Clifton-Morenci-Metcalf copper district of Arizona has been settled, according to a telegram received in Washington on Nov. 1 from the President's Mediation Commission. The dispatch said:

The strike in the Clifton-Morenci-Metcalf copper district of Arizona is settled and the prompt resumption of copper production in this great copper center is assured. The President's Mediation Commission has devised a settlement which will open up the important mines of the Arizona, Detroit, and Shannon Copper companies. The normal monthly output of this district is about 10,000,000 lb. of copper, requiring a working force of about 6000 men. The mines have been idle since July, and various attempts toward settlement have been unavailing. The Government's urgent need of copper made necessary the intervention of the President's Mediation Commission, now successfully concluded.

Men Must Abandon Strikes

In arriving at a settlement the President's commission proceeded upon a few basic principles. The country must have the uninterrupted maximum output of copper during the period of the war. Therefore, for the period of the war the strike as a means of remedying grievances must be abandoned by the men. In place of dislocation strikes the Government must assure the men, for their own and the Government's protection, security in their employment (where there is no just cause for discharge), as well as fair and practical machinery for the ordinary adjustment of grievances, whether real or imaginary, without causing any stoppage of production.

To carry these principles into execution the President's commission has directed a settlement, accepted by both sides, embodying these features: Companies and men must exert their utmost efforts to secure the highest possible efficiency in the production of copper consistent with proper discipline and due regard for the health and safety of the workmen.

The companies will continue to recognize workmen's grievance committees previously existing in the district. Heretofore, however, there was a feeling of impotence as to these committees, because the final say was with the managers. There is, therefore, added to the existing scheme remedying grievances an appeal to the United States administrator, whose decision is binding upon both sides.

Reëmployment is assured to all striking workmen without discrimination, except those guilty of seditious utterances against the United States, or those who have membership in an organization which does not recognize the obligation of contract, or those of demonstrated unfitness for work.

Increased Wages May Advance Copper Price

A claim for increased wages, to conform to the high wage scale in the Globe-Miami district, was one of the causes of the strike. The justice of this claim requires a detailed study of local conditions, both as to cost of living and the financial ability of the companies of this district, as compared with those of the Globe-Miami district. Such an investigation, if it is to be conducted in an authoritative way, would take a great deal of time.

The President's commission therefore did not deem it within its province to enter upon such investigation. Instead, it laid down the principles which should control such a claim for wage increase, and left the application of the principles to the facts as they should be found by the United States administrator. The commission provided that the administrator should determine if any adjustment of wage scale is called for in order to secure a fair living wage, having regard to the high cost of living, to the efficiency, or lack of efficiency, and to the financial ability of the companies.

If the administrator should recommend a wage increase and such a wage scale allows a fair profit to the companies under the existing price of copper, the President's commission shall at once promulgate such new wage scale and the company shall pay all such increases in wages as of the first day of the return of men to work. If, however, such wage scale recognized by the administrator does not leave a fair profit under existing prices of copper, the President's commission shall recommend to the President an increased selling price which will yield a fair profit, and the wage increase recommended by the administrator shall not be made effective until such selling price has been obtained.

In order to secure this wage scale, and in order to determine the fair profit of the companies, the administrator is given complete access to all the records of the companies and has authority to employ all necessary expert assistants. The administrator is Hywel Davies, of Kentucky, who has heretofore rendered valuable service as mediator for the Department of Labor.

The paragraph relating to the reëmployment of striking workmen is assumed to be for the purpose of barring members of the I. W. W. and similar organizations. The Commission has gone to Bisbee, Arizona.

Recruits for Gas and Flame Service

The 30th Engineers is now being recruited from men volunteering for the Gas and Flame Service and will be ready for France by Thanksgiving. Those who can qualify include chemists (analytical, research and manufacturing), chemical workers, powdermen, men experienced in gas manufacture, machinists, automobile repair men, men able to operate and repair gas or steam engines, pipe fitters, electricians, designers, interpreters, carpenters, blacksmiths, plumbers, boiler-makers and chauffeurs. Men with long experience in their trade are especially desired to fill the master-engineer grades. They must be between 18 and 40 years of age and not have been called by a local board in the draft. Application should be made at the nearest recruiting station or United States District Engineering Office.

History of Wire Hoisting Ropes with Notes on Factors of Safety*

Stranded bronze-wire ropes were found in the Pompeian ruins. Modern wire ropes were a development of the 19th century. In recent American practice, imported steels have been supplanted by acid openhearth steel of domestic manufacture. Bending stresses of wire ropes vary inversely as the diameter of sheaves and drums, and reverse bending due to underwound drums will decrease the life of a rope from 10 to 25%. Rope ends are preferably fastened by means of clips instead of sockets, and ropes should be protected from corrosion and frequently inspected.

THE application of wires in the form of ropes for engineering purposes was first introduced in 1813 for use as supporting ropes on the Geneva suspension bridge. They were, however, not constructed in what today would be strictly classed as wire rope, but were formed of a series of wires laid parallel with one another and bound together by means of smaller wires which in turn were covered with tarred yarn. There seems to be no authoritative data available as to the number and sizes of the individual wires used in making up the supporting ropes for this bridge, but it is taken for granted that the material from which the wires were produced was undoubtedly charcoal or BB iron which at that period, and for some time later, was almost exclusively used in the production of wire ropes.

At a later date, 1835, some ropes of this type were produced for the Freiburg suspension bridge which has a span of over 800 ft. in the clear. The supporting ropes for this bridge were composed of about 20 bundles of iron wires laid parallel, each wire being 0.125 in. in diameter and the combined total making a rope about 5½ in. in diameter. There is no doubt that this type of rope, when properly constructed, would present a breaking efficiency nearly equal to the tensile strength of its individual component wires, and perhaps it is the only construction of wire rope in which each wire bears as nearly as possible its due and proportionate share of the load stress. Ropes of this class, while not extensively manufactured, have been applied in this country on the Niagara suspension bridge and the Ohio River bridge and have been used for the large main supporting cables on the Brooklyn suspension bridge; also more recently on the new East River or Williamsburg bridge. This type of wire rope is known as the "selvagee" construction. Unfortunately it cannot be utilized for hoisting purposes.

Early Stranded-Wire Ropes

In 1834 a mining engineer named Albert, of Clausthal, Germany, interested in the mining industries in Saxony, who became later the director of the Hanoverian mines, finally succeeded in fabricating, with considerable difficulty, a "stranded" wire rope composed of iron wires. He put this rope in operation for hoisting ore in the shafts of the Harz mines, where its superiority was immediately recognized over its hempen predecessor; and Albert's efforts were crowned with success. In 1837 Albert, before an engineering society in Berlin, read a paper on the construction and manufacture of stranded-wire ropes. This paper advocated the production of wire ropes along the same lines of construction as were previously applied to the manufacture of hemp and fiber ropes, then employed exclusively in the mining industry. The size of the wire entering into the manufacture of the first stranded-wire rope produced by Albert is said to have been 0.144 in. in diameter, with a tensile strength of about a thousand pounds each, or approximately 27.5 tons per sq.in. of actual cross section. As to the exact number of wires in the strands and the number of strands employed there seems to be no absolutely reliable information. However, it is known that ropes manufactured between 1835 and 1838 were made up of four wires to the strand, each wire being about $\frac{3}{32}$ in. in diameter and the ropes composed of four, six and eight strands. It is evident that there was some variation in sizes of wires as the number of strands increased.

Commercial Manufacture of Wire Ropes

It must thus be conceded that as a direct result of Albert's experiments the commercial world was given a mechanical appliance to which can be traced the establishment of many of the foremost industrial activities of modern times. It was immediately after the first successful experiments, carried out by Albert, that a partnership was formed by Felten & Guilleaume, of Cologne, to manufacture wire ropes upon a commercial scale. These two men were quick to realize the possibilities of a product adaptable to numerous enterprises, and for some time manufactured wire rope for mining purposes in Germany and France. In the Musio Borbonico at Naples is to be found on exhibition a short length of bronze-wire rope, about 1 in. in diameter, which was excavated from the ruins of Pompeii, but beyond the fact that it was made of wires twisted into strands, and the strands in turn laid into rope, there is no other information except that it proves to us that wire ropes made of bronze wires were in existence before the destruction of Pompeii in the year 79 A.D. Beyond this period there is no trace of any stranded ropes, but it is an established fact that the ancients, many centuries before the process of drawing wire through dies was invented, made wire from precious metals by hammering.

First British Patent for Cored Strands

The application of wires to ropes was known to exist in Germany as early as 1813, but their practical introduction in England did not apparently transpire until some years later. Before a meeting of the British Association, held at Newcastle in 1838, Mr. Taylor, F.R.S., read a paper on wire ropes, by Count Brenner,

*Paper read by M. H. Sigafoos, general manager, Hazard Manufacturing Co., Wilkes-Barre, Penn., before the mining-section meeting of the sixth annual congress of the National Safety Council, New York, Sept. 12, 1917.

and in the same year R. S. Newell, of Dundee, England, acting upon information and advice from a friend who was studying mining conditions in Saxony, designed some rather crude machinery for the purpose of manufacturing wire ropes with four strands, each strand containing four wires. Mr. Newell carried on some experiments with his early inventions, on which he gradually improved, until in August, 1840, he was granted his first letters patent in England for improvements in the manufacture of wire ropes and the machinery designed for the process. With these improvements there apparently came the introduction of cores or "hearts," as such were then termed, as Mr. Newell's patent related to the construction of rope with wires laid around a core or heart to form the strand, and several strands laid around a central core or heart to form the finished rope. After these letters patent were obtained by Mr. Newell a company was formed, and under his personal supervision wire ropes were manufactured in England on a commercial scale.

History of American Wire Ropes

In the United States wire rope was first manufactured in the early 40's and has been improved upon year by year until the present time, when it represents the very highest development of this means of hoisting and haulage. In the last fifty years there has been a gradual change from the use of one kind of rope material to another, and this was brought about by the demand for an increased production by speed and efficiency. In the preceding paragraphs I have shown that iron was practically the only material used for wire rope, and this continued to be the case until the introduction of crucible cast steel, which opened the second period in the manufacture of wire rope. The third period came with the introduction of higher-carbon steel known by the trade as plough and special high-strength steel. In none of these periods has the material in the production of wire rope of the preceding period been forgotten, for certain operations still demand iron cables and there are other operations in which it is out of the question to substitute plough steel or the special high-strength steel for cast steel.

Materials Used in Manufacture of Ropes

The material entering into the manufacture of wire ropes is perhaps of greatest importance in the wire-rope industry, for upon its quality depends largely the final result of the finished product. Through careful selection, constant experimentation and analysis, with minute researches into the physical and chemical properties of the raw materials, the industry is guided toward the production of a dependable wire rope with durability and ductility as two of its fundamental qualities.

Until recent years in the manufacture of wire rope it was generally conceded that the foreign steels were by far the best, due principally to the use of Swedish ores. Foreign steel material as imported by the American manufacturer for wire rope purposes is made to meet rigid specifications. This insures as nearly as possible a uniform quality. Such steel is carefully tested and analyzed to verify the percentages of manganese, silicon and carbon as well as of sulphur and phosphorus, which must be extremely low. Acid, open-hearth steels are generally admitted to be of better quality than basic openhearth and it has been suggested that this is due to the higher oxygen content in the basic steel.

Much has been claimed for the qualities of chemically treated steels, such as vanadium, chronium, etc., and in many instances the manufacturers of steel products have proved the claims made for them. So far as their adoption to wire rope is concerned, however, they are still in the experimental stages, and no data are available at this time. Without doubt such elements may eventually be used in connection with domestic ores and produce a finished article for the wire-rope industry as it has for other purposes.

Wires made from materials intended for the manufacture of wire rope for ordinary purposes are divided into three classes, as previously stated, namely, iron with a breaking strain of approximately 80,000 lb. per sq.in., cast-steel, often erroneously called crucible-cast, which has a breaking strain of 170,000 to 180,000 lb. per sq.in., and plough-steel with a breaking strain of 200,000 to 250,000 lb. per sq.in. Wire of higher tensile strength is often drawn, but this is rarely used for any other purpose than for standing rigging on racing yachts, where maximum strength with the lightest possible weight is essential. Such wires are sometimes drawn to 260,000 lb. per sq.in. Small sizes of even higher tensile strength are drawn for wire rope or strands for aëroplane guys.

Life, Stresses and Speeds

There has been much discussion on the question: When has a wire rope reached the end of its usefulness, and when should it be removed? Up to the present, it seems, the question remains unanswered—at least, satisfactorily. In an exhaustive investigation[1] conducted by the Bureau of Standards on this subject the recommendation was made that a rope should be removed after a certain number of broken wires appear in each of the strands. These tables have undoubtedly been compiled from stated loads, speeds, head-sheave and drum diameters; from shafts of various depths, the torsional and load stresses being taken into consideration. It is, no doubt, a useful guide, provided it can be applied where conditions are the same or as nearly alike as those from which these tables and figures were compiled. However, as there is no standard of sheave and drum diameters, except those recommended by rope manufacturers, or any set rule for maximum loads, it is evident that with each variation in the diameter of sheaves or loads there will be a variation in the bending and load stresses. Both stresses are of great importance and each has a direct bearing on the factor of safety. The various conditions of operation that exist in different mines make it almost impossible to find any two that are alike. There can always be found considerable differences in the diameter of sheaves, loads and speeds, therefore it is obvious that no set rule can be laid down by which all mining operations can be governed.

In the catalog of the wire-rope manufacturers are to be found the "proper working loads" of wire ropes for the given sizes and grades. This proper working

[1]Bull. 75, U. S. Bureau of Standards, Washington, D. C.

load in almost all cases is approximately 20% of the breaking strength of the rope, and would appear to be a factor of safety of five. This, however, is not the case, as will be shown, and it is important, in calculating the proper size of rope for a certain load with a required factor of safety, that this proper working load should not be confused with the actual factor of safety. While the proper working load does show approximately one-fifth of the breaking strength of the rope, it does not by any means indicate that in operation a rope, selected on account of its showing a proper working load in the list corresponding to the load which it is desired to lift, would have a factor of safety of five. This is due to the fact that in addition to the working load there are other stresses to which ample consideration must be given; the most important of these is the stress due to bending over the sheaves and drums. If the rope to be used is operated over standard-sized sheaves and drums, as recommended by the rope manufacturers, the general average of this bending stress equals about 10% of the approximate breaking strength of the rope. For instance in a cast-steel wire rope, of 1-in. diameter and composed of six strands having 19 wires to the strand, the approximate breaking strength is 30 tons and shows a proper working load of one-fifth, or six tons. This, however, is only to be used on a minimum-size sheave or drum of 4 ft., as recommended by the manufacturer. The bending stress would be 2.7 tons, or 9⅛% of the approximate breaking strength of the rope. It is thus evident that by adding 9⅛% to the 20% load stress we have utilized 29⅛% of the ultimate; and, instead of an apparent factor of safety of five, we actually have only 3.41. This factor is still further reduced by the stress due to starting the load, and also, in some cases by the stress due to the weight of the rope and its inertia. The latter, of course, varies with the size and length of the rope, and in calculating the proper sizes of rope required for hoisting operations, where ropes are often long and heavy, their weight must be considered and added to the ore load, weight of cage and cars, or skip, as the case may be, in order to arrive at any true factor of safety. For short lengths of rope of small diameter, such as used on derricks, etc., this latter calculation is not necessary.

Effect of Sheave and Drum Diameters

It is often impracticable to utilize the sizes of sheave and drum recommended by the manufacturer. When different diameters must be used, the bending stresses will vary inversely as the diameters. For instance, assume in the example given that a 2-ft. diameter sheave is to be used. The bending stress produced would be 5.58 tons, or about 18⅝% of the breaking strain of the rope. This, in addition to the working load, would be 38⅜% of the ultimate strength of the rope, thus reducing the factor of safety to 2.6. Under these conditions the total working stress would be greater than one-third of the ultimate breaking strength of the rope when new, and this factor of safety is not considered good engineering practice. Obviously under such conditions a wire rope could not possibly give the same service as when operated over the standard or larger-sized sheaves or drums. On the other hand, if we should employ sheaves of twice the diameter of those recommended by the manufacturers, or 96 in., the bending stress would be only 1.4 tons (approximately) or about 4⅛% of the ultimate strength of the rope. It is evident that by reducing the bending stress to a minimum more economical service could be obtained; and in many cases a smaller diameter of rope could be applied to do the required work, thereby increasing the efficiency of the rope and making a considerable saving in first cost.

Reverse Bends Reduce Strength and Life of Ropes

Regarding bending stresses it might be well to describe briefly the effect of these stresses on the initial structure of the metal in the wire rope. It has been shown repeatedly that reverse bends play an important part in the early deterioration of a wire rope. The under-wind rope in which there are reverse bends will invariably give a shorter service than the over-wind rope. The difference in service of the two ropes on a hoist varies a great deal, but from experience it has been observed that the over-wind rope will give 10% to 25% more service. The reason for this is quite obvious, but I shall endeavor to explain as clearly as possible the causes leading to the shorter service of the under-wind rope.

The under-wind rope as it comes off the head-sheaves has taken somewhat of a set, the permanence of which depends altogether on the relation of rope diameter to sheave diameter. The smaller the sheave, the greater the set. The rope now travels to the take-up drum which is set some distance away and will wind on the drum in the opposite direction to the way it came off the head-sheave. A reverse bend is thus thrown into the rope and consequently into the wires themselves. The rope cannot recover itself in most cases, for the set received at the head-sheave is not entirely overcome before it strikes the take-up drum, and consequently the effect of the latter bend is more severe. Wires removed from ropes that have been retired from service, operating under conditions of reverse bending, show under the microscope that minute cracks have been set up in the steel, sometimes running in planes between the grains, while in other cases the grains themselves have cracked. Examination made of the steel at different points shows that the nearer the break, the more developed are the cracks and fissures. Of course these minute cracks will eventually develop into larger cracks which will in due course cause the wire to part, and later, if the rope be not removed in time, the breaking of the entire rope.

Repeated Shocks Weaken Ropes

Another cause for failure of wire ropes can be attributed to repeated shocks. A rope may fail because of combined stresses beyond the breaking strain, or on account of a succession of applied loads in excess of the elastic limit, and it may also fail by reason of repeated shocks; that is, loads applied that may reach the elastic limit at intervals of minutes or hours. The effect of these strains, or over-strains as they may be called, is shown best by a microscopic examination of the metal. They lead to crystallization with a consequent embrittlement of the steel.

A rope will wind on a drum, coil beside coil successively, until the end of the drum or drum flange

is reached. At this point the rope will have to wind upon itself. After making the first coil upon itself there is a tendency for the second coil to mount or overlap upon the first. This at once readjusts itself by the instability of the position, but the act of slipping into place alongside the first coil is accompanied by a sharp snap which always occurs at the same point on the rope. The effect of this is twofold:

1. It will cause jerks that will increase the load on the rope by an amount dependent upon the amount of slack between the drum and the head-sheave. In most cases this is small, but in time the wires will show the effect of these shocks not only from the increased load but also from the vibration in the rope which usually settles at one point, causing trouble later on.

2. The inner series of wires will crush somewhat from the squeezing between the top and bottom layer and will assume a pear or bell shape. In this disturbed condition it is impossible for the inner wires to perform their proper function, and the outer wires will be forced to take more than their share of the stresses. Not only this but they will also gradually assume the shape of their cushion, the inner series, causing trouble as a result of abrasion.

Of course we know that overlapping cannot be eliminated in most cases on account of the amount of rope that must be taken up on the drum, but the point to emphasize is the fact that frequent inspection must be made of the rope in order to minimize accidents.

Methods for Fastening Rope Ends

The effect of overloading has already been referred to in the foregoing, but in addition it might be well to state that wire ropes are constructed to take care of certain loads, and when these loads are exceeded, the steel in the rope must suffer. The rope as made has a certain lay and the method of attachment to the load has a great deal to do with the running out of the lay and stretch of the rope. This should not be confused with the material itself. There are several methods of fastening ropes to the load, and it can be done by means of either sockets or clips. Fastening by means of either of these methods can be done in such a manner as to break the rope before the connection gives out. In the case where sockets are used it was formerly thought necessary to turn or bend back the strands or wires into the basket of the socket. This method is now being replaced by a process of opening the wires in the strand of the rope which is to be socketed, thoroughly cleaning them with muriatic acid, cut down with zinc, and pouring in molten zinc. Tests of this method of socketing have proved that a more uniform strain on each individual wire can be depended upon. However, it necessitates taking great pains and carries with it at all times the danger of no possible means of inspection. The connection made with clips, if properly applied, is equally strong, and careful inspection can always be made of such a fastening. The latter connection should be made with the curved section of the U-bolt clip over the short end of the rope. This insures more safety, as there is then no indentation on the main section of the rope made by the U-bolt. From a safety point of view it is preferable to socketing.

I believe that all users of wire rope appreciate the value of protecting the rope from mine and other injurious waters which corrode and take into solution the steel of the rope, but it might be well to state that the most dangerous element is often neglected. In mine water the sulphur has been taken into solution, resulting in the formation of sulphuric acid, and when this acid attacks the steel there is liberated hydrogen, which causes a great deal of trouble. . . . In order to keep corrosion at a minimum it is absolutely necessary to cover the rope, or at least fill the interstices of the rope, with some sort of protective preparation. A mineral compound of the right consistency has been found to be the proper material to use for this purpose.

In dealing with the problems in which wire rope plays an important part it is most essential that a man be employed who is familiar with the construction of wire rope and its application. This knowledge has resulted in the employment by most mining companies of an inspector. The duties of the inspector are too numerous to mention, but the mere fact that there is such a position emphasizes the point that wire rope is a part of the equipment that requires expert knowledge, careful handling and the most rigid inspection.

In conclusion, I wish to state that the points covered in this paper are the results of practical experience covering a period of nearly three-fourths of a century. During this time the merits of suggestions offered have been proved by test and actual service, and have been adopted as standards by our engineers.

A Great Byproduct Coke Plant

The Carnegie Steel Co. is progressing well in the construction of the new byproduct-coke plant at its Clairton works. Three towboats and a fleet of barges are nearly completed to carry coal from the company's mines in the sixth pool on the Monongahela to Clairton. Work is in progress on the branch railroad which is to carry the finished coke to the works at Braddock, Homestead and Duquesne, and contracts have been let for the pipe line which is to convey gas from the coke works to the Edgar Thomson and Duquesne plants. This pipe line will be about 10 miles long, in part 40 in. and in part 30 in. in diameter.

The plant at Clairton is to be a large one and the intention is to make it the center of fuel supply for the company's chain of works around Pittsburgh. It is expected to reduce the cost of fuel to these works, besides regulating the supply, and there will be a considerable profit from the byproducts.

Tax Assessment of Michigan Mines

By A. L. H. Street*

Under the provisions of the Michigan tax laws, to the effect that for the purposes of taxation the "cash value" of property shall be taken to be its "usual selling value," the price at which an iron mine was recently sold is only a circumstance to be considered in assessing the property, and is not conclusive as to the "cash value" of the mine, according to the decision of the Michigan Supreme Court recently announced in the case of Cleveland-Cliffs Iron Co. vs. Republic Township, 163 Northwestern Reporter, 90.

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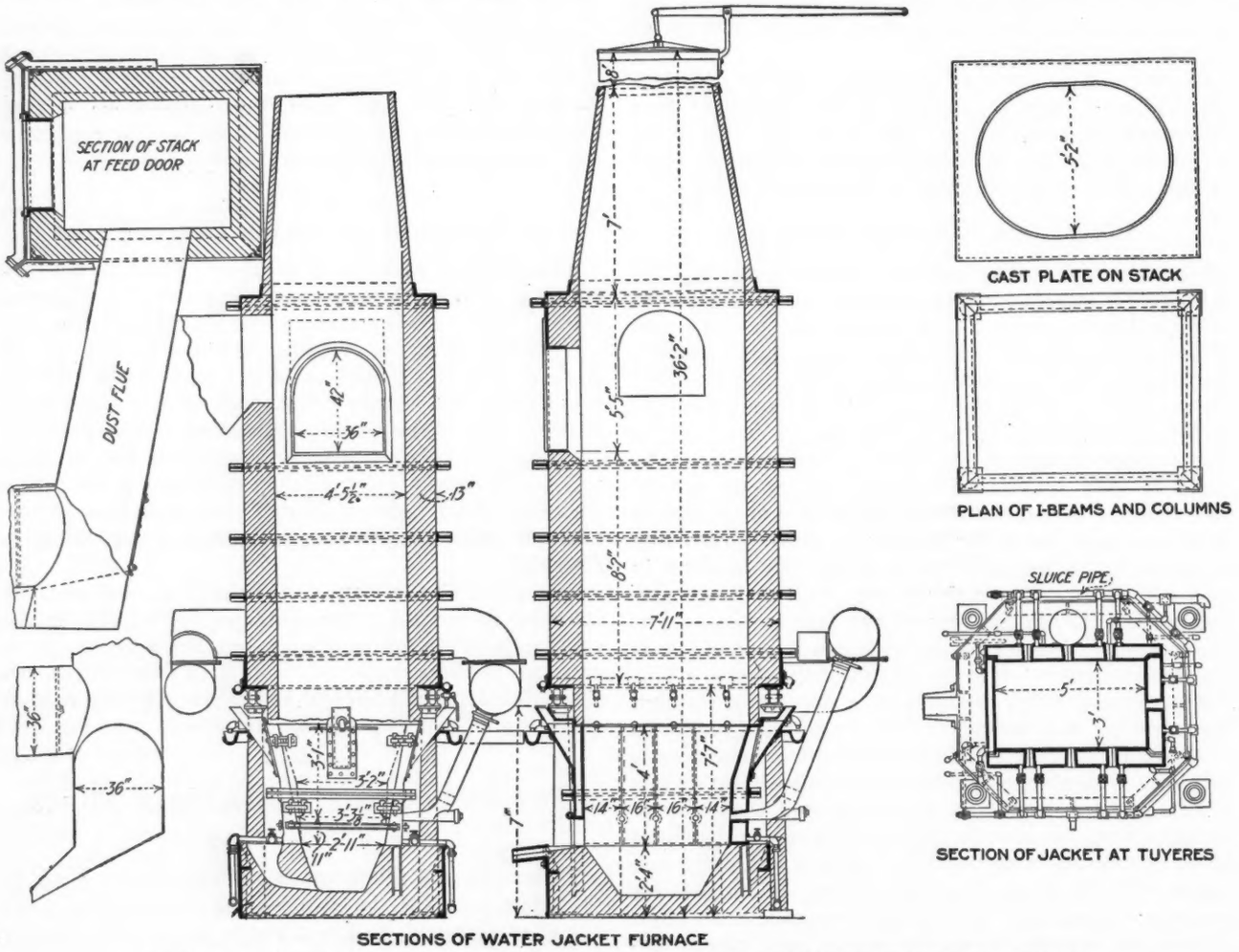
An Early Type of Water-Jacketed Smelting Furnace

By CHARLES C. CHRISTENSEN*

An account of the building of the first water-jacketed lead-smelting furnace at the old Fraser & Chalmers works in Chicago. This type of furnace, then new to the staff, was made to order on short notice for the Hecla Consolidated Mining Co. of Glendale, Montana Territory.

NEARLY 40 years ago the first[1] Fraser & Chalmers water-jacketed smelting furnace in the United States was designed and built in Chicago. At that time Chicago was a small city—about one-fifth of what it is today—and at the corner of Fulton and Union Sts. there was a machine shop where mining machinery was made. Mining men from the Western territories, whenever they had some new ideas, made a "bee line" for this Chicago corner because at the Fraser & Chalmers shops they could have their ideas transformed into drawings, specifications and machinery built under their own supervision. Moreover, all contracts were strictly fulfilled even if, as sometimes happened, a loss resulted to the manufacturers. A square deal was the motto and no "treaty" was ever broken.

Early in March, 1880, the late Horace Brown came in one frosty morning from the Montana Territory. He appeared dressed in miners' overalls and had with him a suitcase and a roll of roughly made pencil drawings. Without much formality he said that he wanted designed and built a 36 x 60 in. lead-smelting furnace with water jackets. At that time I was employed at that interesting corner as a mechanical engineer and draftsman, and was appointed to wait on Mr. Brown and make all the drawings to suit his idea.



SECTIONS OF WATER JACKET FURNACE

DESIGN OF A FURNACE BUILT IN 1880 AT THE FRASER & CHALMERS WORKS IN CHICAGO

*Estimating engineer, mining machinery department, Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

[1In volumes 40 and 41 of the "Journal," 1885 and 1886, the question as to who built the first water-jacketed furnace was thoroughly discussed. Two communications are reprinted on p. 844 of this issue. In the "Journal" of Nov. 9, 1878, on p. 329, F. Kupelmeiser describes briefly the type of furnace used by the Detroit and Lake Superior Smelting Co. at Hancock and at Detroit, Mich., for smelting slags from Lake Superior copper ores. The boshes, he says, were formed by a hollow casting, 1 ft. 8½ in. high, cooled with water.—Editor.]

This was before the blue-printing time. The general drawings were made on heavy, white paper, inked and colored to show the different kinds of material. A tracing was made of these drawings for the customers. The details were drawn on plain yellow paper, inked and traced. These tracings were pasted on heavy cardboards, varnished over and forwarded to the shops. Sometimes even the general drawings had to be forwarded to the shops—for instance, when a new machine, never built before, had to be assembled before shipment. So it was in this case and the shopworn condition of the original drawing is responsible for any variations in the accompanying reproduction.

The curb of this furnace was 2 ft. 4 in. high, and had heavy, ribbed cast-iron sides made up in six sections and bolted together as shown. The cast-iron spout was bolted to the end curb plate under the tap opening. The water-jacketed portion of the furnace was 36 x 60 in. at the tuyere line and 48 in. high. It consisted of eight cast-iron side jackets, two rear-end jackets, all boshed 8½ in., and one straight, front-end jacket, 37 in. high, leaving the 11-in. high tapping breast. All the jackets had ears cast on, for connection by clamps and keys, and were also provided with heavy T-steel binders.

To each jacket was bolted a cast-iron overflow spout with nipples and elbow for discharge into the overflow launder surrounding the furnace. There were seven Y-type tuyeres 3½ in. in diameter tapering to 2¾ in. in diameter in the jacket tuyere openings. They had canvas hose connections to the air gates which were connected by short cast-iron nozzles to the 20-in. bustle pipe. The sluice pipes were laid horizontally on top of the curb, bending over at the edge, and came down below the floor and there connected to a main discharge pipe running outside the furnace building.

The supply water main was placed right above the overflow spouts with a tee and nipple connecting to each spout. Hangers, supporting this water main, were bolted on the brick-stack deck plate. Four cast-iron columns, 7 ft. long, 6 in. in outside diameter at top, 8 in. in outside diameter at bottom, of 1-in. metal, supported the mantel frame which consisted of two 7-in. 15-lb. I-beams at the sides and ends, with corner angles, pipe spacers and bolts for connections.

Upon the mantel frame rested the heavy, cast-iron angle deck plate supporting the brick stack, the outside dimensions of which were 7 ft. 11 in. by 6 ft. 7½ in., with 13-in. thick brick walls. The binders were made of T-steel—five sets as shown—clamped together at the corners by U-bolts, washers and keys. To the cast-iron top plate was bolted a sheet-steel, conical hood, 7 ft. high, which was brick-lined. On top of the hood was a steel stack, 8 ft. high and 48 in. in diameter, with damper, also brick lined. The feed-door frame, 36 in. wide by 42 in. high, was of arched design. The downtake opening was 36 x 36 in. with circular top. A sheet-steel downtake of same dimensions, with damper, completed the furnace.

The general dimensions were as follows: Floor to top of curb, 2 ft. 4 in.; to tuyere line 3 ft. 3 in.; to top of jackets 6 ft. 4 in.; to stack deck plate 7 ft. 7 in.; to charging floor 15 ft. 9 in.; to top of brick stack 21 ft. 2 in.; to top of hood 28 ft. 2 in.; and total height of furnace, with stack, 36 ft. 2 in. The furnace was designed, built and shipped in a remarkably short time. It was built for the Hecla Consolidated Mining Co., of Glendale, Montana Territory. The capacity of the furnace was 50 tons of charge per day of 24 hours.

Rumanian Consolidated Oilfields

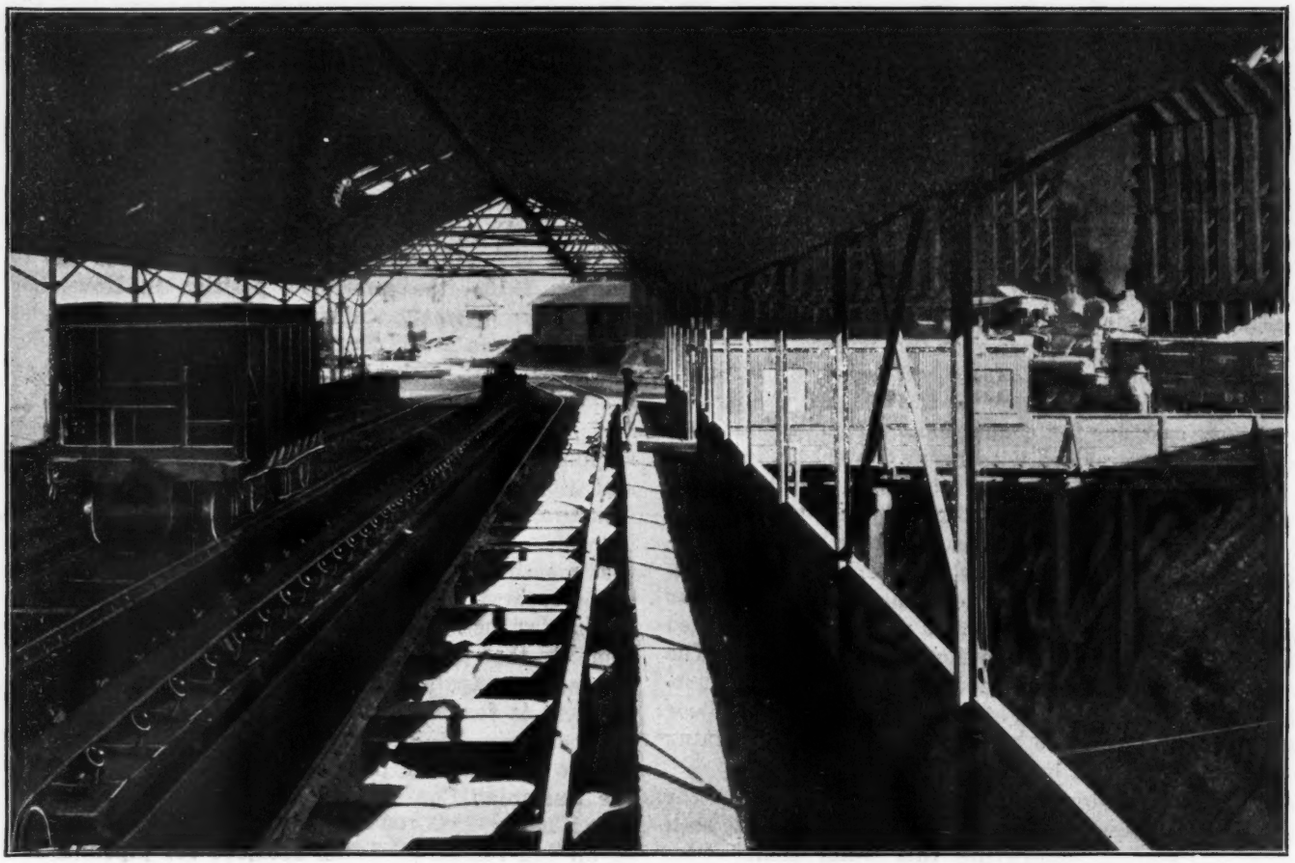
The report of the Rumanian Consolidated Oilfields, Ltd., for the year ended June 30, 1917, shows that the operations of this company are now suspended and the works and other improvements destroyed. During its first four years a total of £500,537 was earned and was mainly employed in development and extension. While the development work incident to every new undertaking was being actively carried out, crude oil was produced to the amount of 313,628 tons, and, notwithstanding all the difficulties caused by the European war (in which Rumania was neutral until the end of August, 1916), the company's position in November, 1916, was: Acreage (upwards of 90% still undeveloped and large areas not yet tested), over 5000 acres; refineries, two; workshops, five; oil pipelines, 175 km., steam, water and other pipelines, 120 km.; tankage on fields, etc., 60,500 tons; tankage at Constanza (for shipping purposes), 5000 tons. The company had installations with producing wells at Bana Moreni, Baicoi, Chiciura, Bordeni, Telega, Bustenari and Campina, all of which were in operation in November, 1916. In that month and in December, for military reasons, the property was carefully and systematically destroyed.

The destruction of the works and plant has been so complete that the company will have to begin exploitation all over again. Its claim against the British government is for £1,270,700, and in addition it asks for 5% per annum interest on this sum as from Nov. 27 last to the date of payment. For its own property the Rumanian Consolidated claims £856,100, the chief items being £235,100 for wells, £197,700 for stocks of oil and refined products, £102,800 for pipelines and fittings, £80,900 for materials in stores, £61,500 for tanks and £46,800 for drilling tools. For the Chiciura (a controlled) property the claim is £136,500. A sum representing loss of earning capacity during replacement calculated at 8½% interest for two years on the more or less fixed assets means an addition of £278,100. Besides this the company expects to put in other claims. These would cover any material damage done to such lands and damages for the expiry and possible loss of some of the leases during hostile occupation.

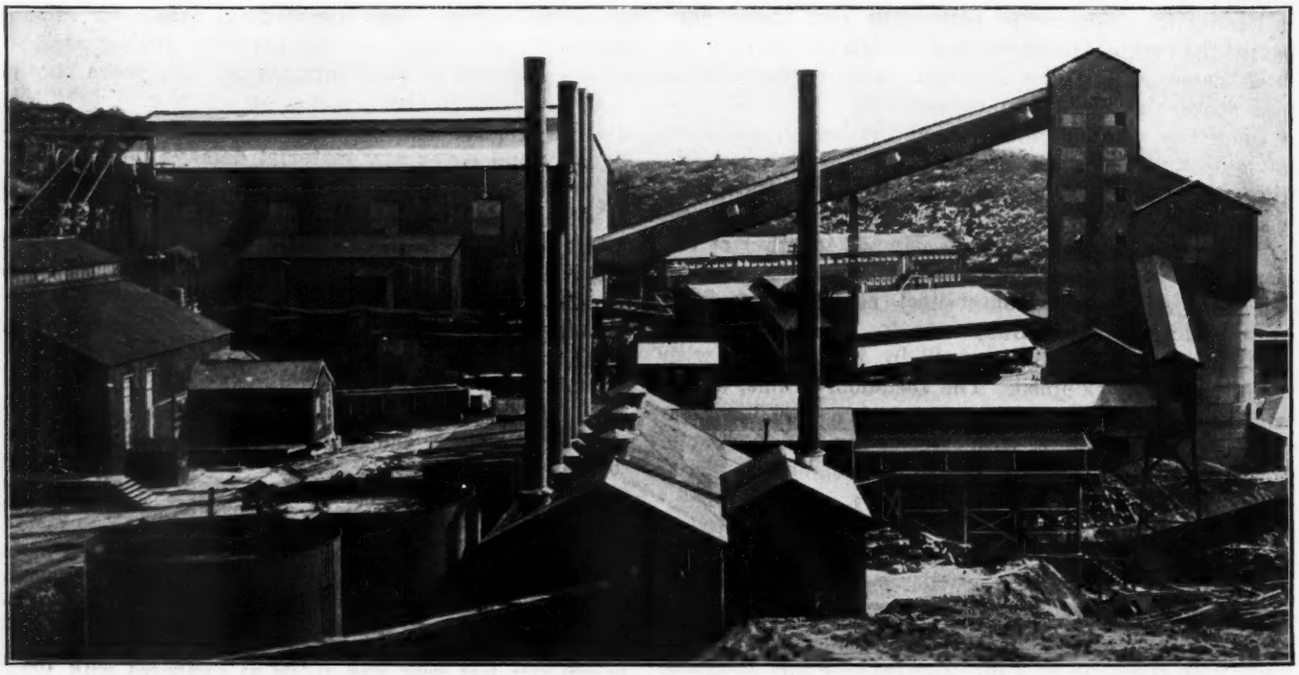
There are 14 English companies in a similar position and it is proposed to form some sort of amalgamation for the purpose of presenting their claims in a systematic manner and making some arrangements to resume work after the war.

Coke-Oven Accidents, it appears, are greater on byproduct coke ovens than in the case of beehive ovens. According to statistics collected by Albert H. Fay, of the United States Bureau of Mines, the fatality rate for all ovens in 1916 was 1.32 per 1000 men employed, and was 1.21 in 1915. The total number of men reported employed in this industry was 31,603 in 1916, and the number of coke ovens in operation 68,796, of which 7090 were byproduct ovens. The fatality rate for beehive ovens was 1.29 per thousand 300-day workers, and for byproduct ovens 1.35; corresponding rates for 1915 were 0.65 and 1.75. The byproduct-oven injury rate last year was 217.09 as compared with 100.37 for the beehive oven.

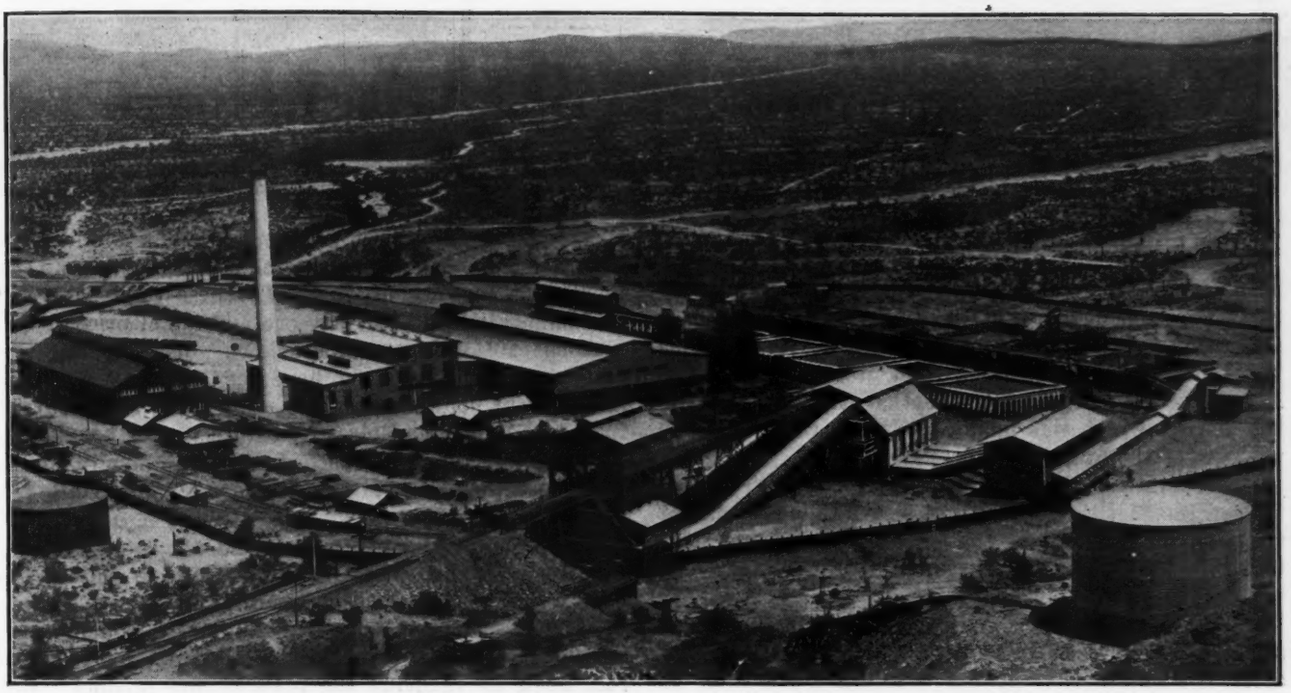
Photographs from the Field



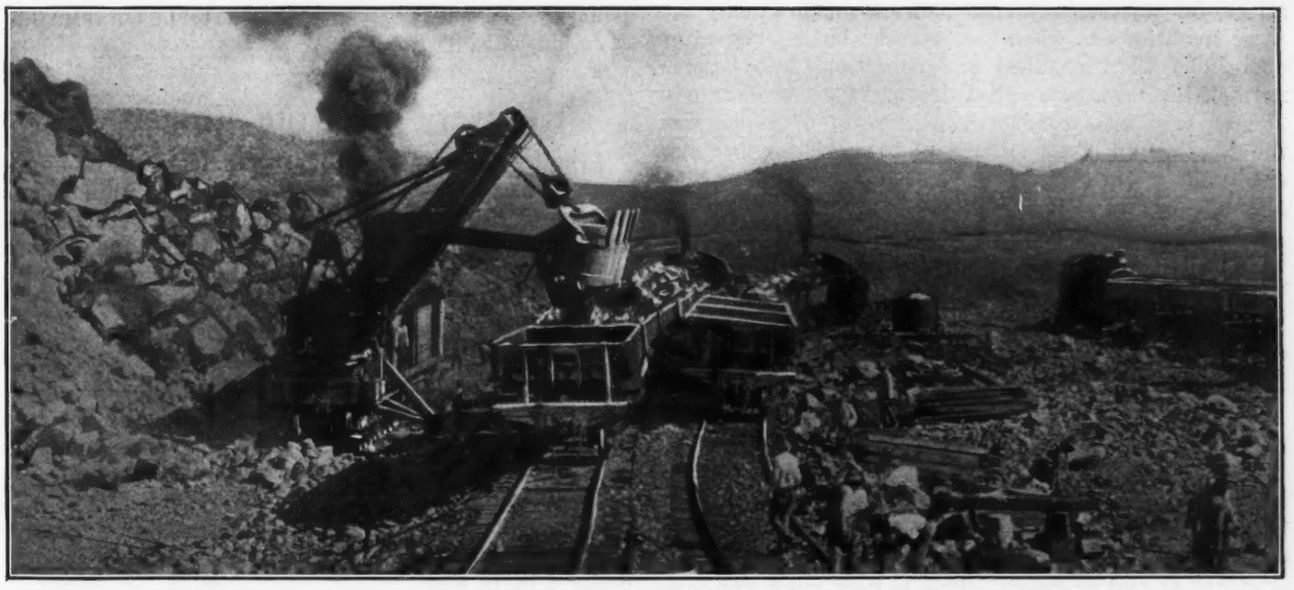
STOCK BINS AT OLD DOMINION SMELTERY, GLOBE, ARIZ., SHOWING TRACK SYSTEM



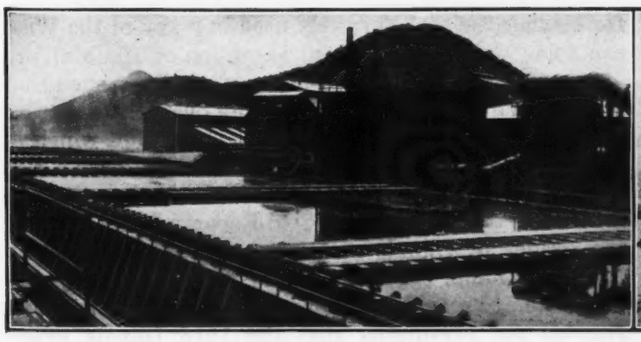
CRUSHING AND SAMPLING PLANTS AND ORE-STORAGE BINS AT OLD DOMINION CO., GLOBE, ARIZ.



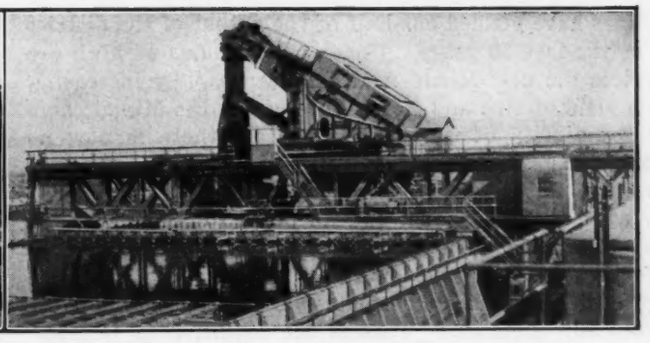
GENERAL VIEW OF THE WORKS OF THE CORNELIA COPPER CO., AT AJO, ARIZ.



STEAM SHOVEL AT THE NEW CORNELIA COPPER CO.'S PROPERTY AT AJO, ARIZ.



LEACHING TANKS AND ROASTERS



HULETT UNLOADER AT LEACHING TANKS

Correspondence and Discussion

Some Observations on Arizona Strikes

In an article entitled "Some Observations on Arizona Strikes," published in the *Journal* on Oct. 13, 1917, the statement was made: "The situation at Clifton-Morenci was more like a real strike than at any other place. About two years ago a four-months' strike occurred in the district which was finally settled by concessions on the part of the mine operators."

The operators of this district have called to my attention the fact that this might be misinterpreted. At the outset of the strike in September, 1915, the operators made the statement that they would take up the question of grievances, wages, etc., just as soon as the Western Federation agitators had been eliminated; the strike was really settled and the men returned to work after the elimination of the Western Federation of Miners about four months later, the local unions having abrogated their charters and returned them to Denver headquarters. This was the real settlement of the strike, for the men returned to work under exactly the same conditions as when they struck; but shortly after operations were resumed and conditions had become normal, the managers called a conference of their employees to discuss conditions, the result of which was the drawing up of an agreement to cover the working conditions of the future. CHARLES F. WILLIS.

Tucson, Ariz., Oct. 19, 1917.

[A satisfactory adjustment of the 1917 labor troubles in the Clifton-Morenci-Metcalf district appears to have been effected by President Wilson's Mediation Commission, which on Nov. 1 informed him that the strike had been settled and resumption of output assured.—Editor.]

The Zinc Situation

The *Journal* has recently referred to the spelter market as having probably reached bottom, because a large share of the zinc output of this country is now being produced at cost or below. This is very much the case in the Joplin district, where the Webb City sheet-ground camp is almost entirely shut down and the mines are being abandoned and flooded. Yet the sheet-ground mines have yielded one-half of the output of the district for the last 10 years. Under the stimulus of high ore prices the new Miami field has been rapidly increasing its yield of zinc and lead. But even in the Miami camp the majority of the mines find that there is now no profit in producing ore to sell at $60. This price represents less to the miner today than did $40 in 1914. Wages, dynamite, fuel and all other items of cost are about double what they were in normal times. Referring again to the opinion of the *Journal* that the price of zinc has hit bottom, unless production is to be radically curtailed: That is the condition in October. But looking forward into the near future, three conditions stand out against production being maintained: (1) Cold weather; (2) increasing scarcity of labor; (3) increasing scarcity of fuel. To these may be added the dampening effect of low ore and metal prices.

About 10% of our miners have gone into military service. These, obviously, have been our most vigorous and efficient young men. The same thing has occurred in the coal fields and already, before winter has set in, the fuel question has reached a hand-to-mouth situation. A blind man can see shutdowns and curtailment ahead.

In war time, when zinc and lead are vital items in industry and with labor and fuel shortage plainly impending, it would seem bad business or "non-preparedness" to press prices down to the point of reducing production. In normal times a surplus production will correct itself by reducing the price of the product. But now, with growing shortage of fuel and labor so certain, the forcing down of production seems an error and the creation of moderate reserves would appear a wiser policy. TEMPLE CHAPMAN.

Joplin, Mo., Oct. 29, 1917.

Recovery of Pyrite From Coal

I notice that on p. 513 of the Sept. 22 issue the *Journal* has summarized my University of Illinois bulletin entitled "The Utilization of Pyrite Occurring in Illinois Bituminous Coal." As a footnote the *Journal* published the following statement: "The flow sheet is reproduced from the original in which the screenings size and No. 5 nut seem to be transposed."

The flow sheet is as I intended. The coal called screenings size is in Illinois generally all sizes mixed from 1½ or 2 in. down to 0, so that evidently the tailings product coming from a Harz jig which treats 1½ to ¼ in. would approximately be of screenings size. The coal referred to as No. 5 nut is the undersize from a ¼- or ⅜-in. hole. This size would, of course, be comparable with the Wilfley table tailings from treating a product under ¼ in. in size. E. A. HOLBROOK.

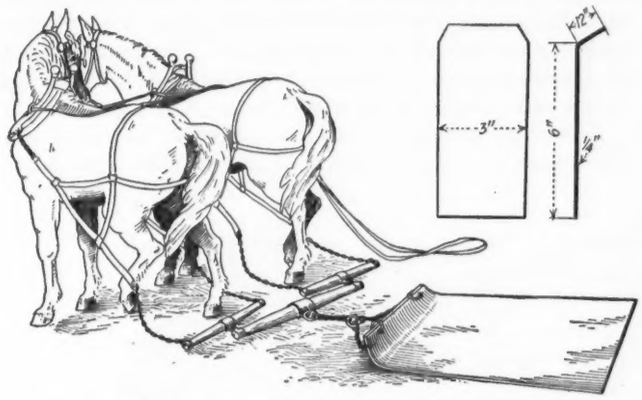
Urbana, Ill., Oct. 4, 1917.

[The *Journal* is glad to learn authoritatively the data regarding sizes of Illinois coal. The "Pittsburgh scale" for bituminous coal, formerly used in many of the Western fields (with the apparent exception of Illinois) provided for four grades: Run-of-mine, or unscreened coal; lump, which includes all coal passing over a straight-bar screen with bars 1¼ in. apart in the clear; nut, which includes all coal passing through a 1¼-in. and over a ¾-in. screen; slack, including all that passes through the ¾-in. screen. In the 35th Annual Coal Report of Illinois, 1916, the grades of Illinois coal are indicated on p. 23 as: Mine-run, lump, egg, nut, pea or screenings, and slack or waste. Professor Holbrook can hardly blame the *Journal* for presuming that the 1916 Illinois grades were still in fashion.—Editor.]

Details of Practical Mining

Sheet-Steel Slip for Hauling

An excellent conveyance for hauling loads, such as castings, pipe, drill steel, etc., may be made from a piece of discarded sheet steel, about 3 x 6 ft., bent up at one



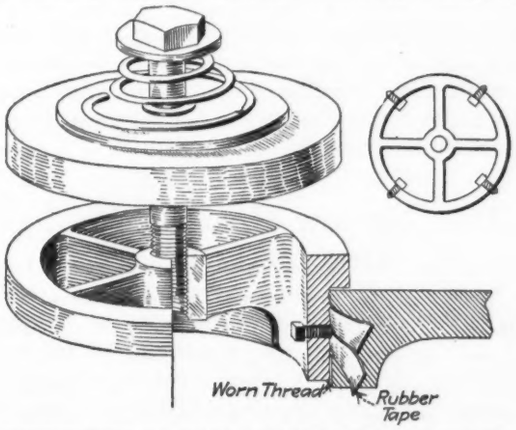
SLIP FOR HAULING MADE FROM OLD STEEL PLATE

end to avoid obstructions, and fitted with a set of double trees for a team.

A great advantage over a wagon is the ease with which it can be loaded, as it is not necessary to lift the material up 3 or 4 ft., which is the case with a wagon, thereby effecting a saving both of time and labor.

Loose Pump-Valve Seat Secured To Prevent Shutdown

Quick repairs are sometimes necessary in order to avoid an expensive shutdown, and in many cases a simple remedy applied quickly will keep things going



SETSCREWS TO HOLD VALVE SEAT IN PLACE

until there is time to make permanent repairs. J. W. Stanley in *Power* tells of a method used in making temporary repairs on a boiler-feed pump. The threads in the valve plate of one of the suction-valve seats were so corroded that nothing was left to hold the valve seat in place and it was necessary to get the pump in working order as soon as possible. Four holes were drilled and tapped for ¼-in. setscrews through the side of the valve seat and midway between the ribs. The valve seat was wrapped around with two turns of insulating tape, driven to a solid seat and the setscrews tightened. This gave satisfactory service until permanent repairs could be made.

A Tack Map for Superintendents

To secure a better idea of the conditions existing in a group of mines that had been worked in a haphazard manner, H. D. Easton makes use of a tack map which he explains in *Coal Age*. The tack map shows each working place and what progress is being made from week to week.

Moore push-points in different colors are used, the scheme of colors, or legend, being: Blue, for narrow work, such as entries and aircourses; red, for rooms; white with black eye, for robbing work; orange, for air

ILLUSTRATION OF TACK MAP

punchers; yellow, for electric mining machines; purple, for pumps; black, for siphons; white, for fans; and green, for sidetracks.

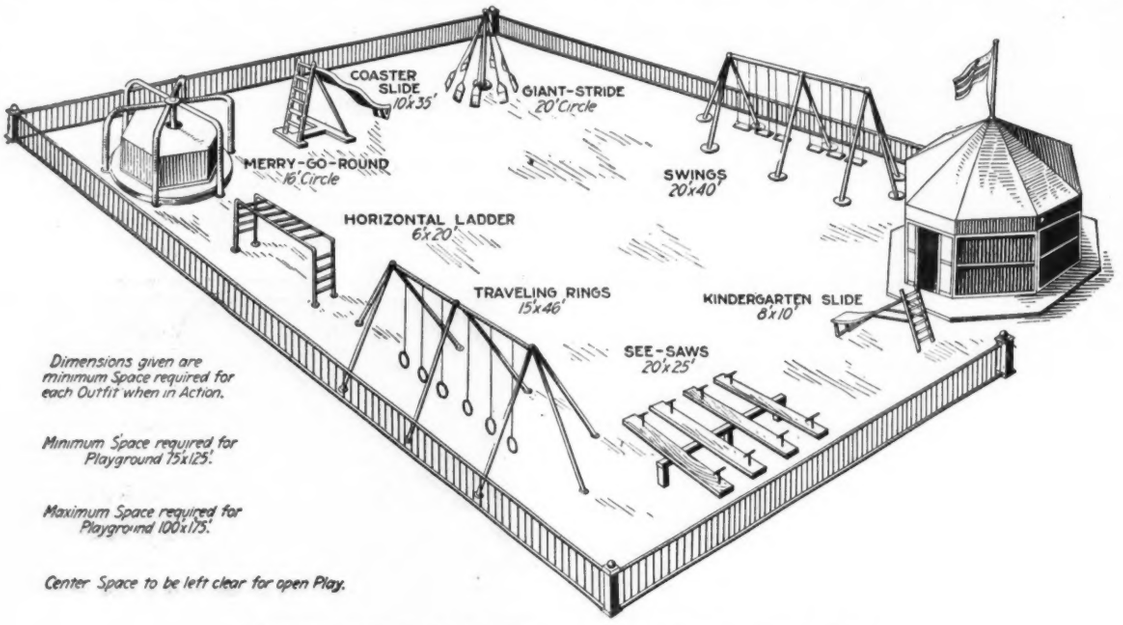
A single blueprint map, showing five mines on a scale of 300 ft. to the inch, is fastened to a board background on an easel so as to be easily moved. This arrangement places the tack map within reach so it can be studied and the tacks shifted about to keep pace with changes inside the mines.

The daily mine foreman's reports are provided with a place for noting information for the engineering department, members of which are required to keep all mine maps up to date, give sights for all new rooms and immediately measure up and map every worked-out place. Each foreman is instructed to write on his daily mine report "sights needed" and "places driven up,"

and the engineers must note these things from the reports, which are kept on file at the desks of the assistant superintendent and the chief mine foreman. The engineers move the tacks on the map each week.

Playgrounds for Miners' Children

The modern idea for maintaining good labor conditions at mining properties is to select men that are fitted for the work to be done and then make the environment such that the workers will feel at home. Wanderers are seldom efficient, and a constantly changing working force is a direct cause of high costs and of a high accident rate. Where there are no children, no true homes exist. When children live in a mining community, the natural exuberance of childish activity tends to lead them into dangerous forms of play unless something is provided to transmute "devilishness" into harmless mischief. In a recent issue of *Coal Age* some good suggestions for playgrounds are given by H. Blain Lacy[1] and in the accompanying illustration is shown a form of playground which has proved a good investment in the coal-mining regions of Pennsylvania. With an attraction like this, the attendance of children at the waste pile, tipple and railroad tracks falls off, and a source of hindrance to the operation of the mining plant is minimized.


COASTER SLIDE 10'x35'
GIANT-STRIDE 20' Circle
MERRY-GO-ROUND 16' Circle
SWINGS 20'x40'
HORIZONTAL LADDER 6'x20'
TRAVELING RINGS 15'x46'
KINDERGARTEN SLIDE 8'x10'
SEE-SAWS 20'x25'
Dimensions given are minimum Space required for each Outfit when in Action.
Minimum Space required for Playground 75'x125'.
Maximum Space required for Playground 100'x175'.
Center Space to be left clear for open Play.

LAYOUT FOR A PLAYGROUND FOR MINERS' CHILDREN

In the playground shown, the various pieces of apparatus are grouped around a common center, which is left vacant for running games, drills, etc. It is important that apparatus should be so constructed that there is no danger of its working loose from the severe vibration to which it is subjected. A joint recommended by the author is that of the "Diamond" all-steel playground apparatus, which consists of the pipe being held securely in the fittings by means of compression dogs. The dogs are drawn tight by means of bolts which fit close into the fitting, eliminating any protruding setscrew. In the summer house is a sand pile and around the inner wall is a bench. Experience has shown that the mothers in a mining community like to bring their small children to play in the sand pile, while they can sit and knit and gossip a bit or do odd jobs of sewing as they tend the little ones and at the same time keep their larger progeny more or less under surveillance.

It has been found that a playground will give better results if placed in charge of an instructor a few hours every day. As a rule, the school teacher of the community is the best instructor for a summer playground. Where several mines are situated within easy communication, it is a good plan to secure the services of an experienced playground instructor to spend a few hours each day at each of the playgrounds. The children can be directed in their play and taught beneficial games which can be continued after the supervisor leaves.

At one mine, where such a playground was installed, the superintendent is quoted as saying that it paid for itself in a short time by the saving of broken windows in the community. At another property, where no playground had been installed, three miners stated as their reason for quitting that at the neighboring mine there was a place for their children to play.

[1]President, Safety First Supply Co., Pittsburgh, Penn.

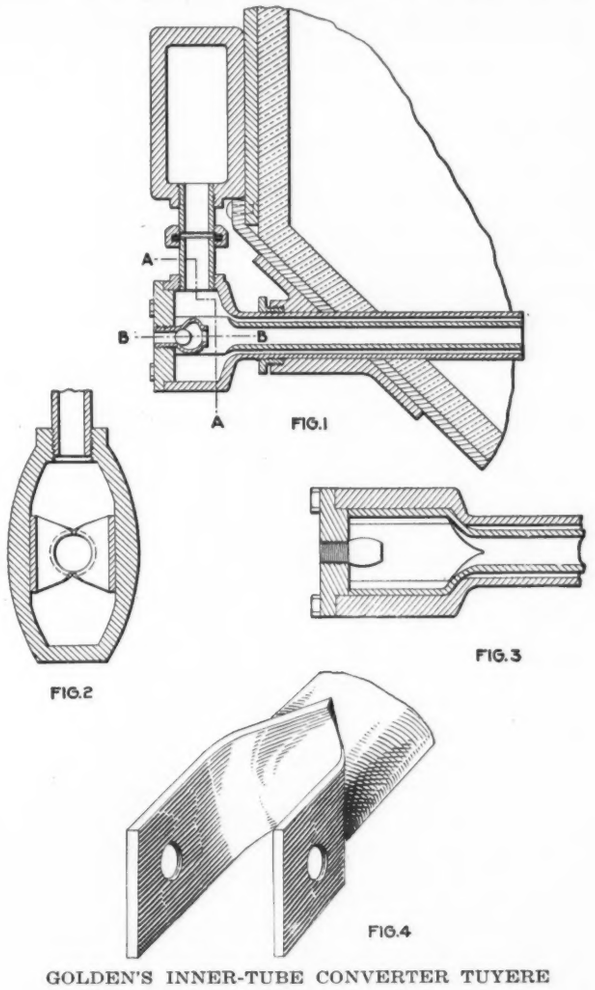
Two Narrow Roads Instead of One Wide Road

In Italy there are numerous single-track roads through the mountains, whereon traffic is permitted to travel only in one direction, according to *Engineering and Contracting*, Sept. 5, 1917. This, of course, necessitates two parallel roads to accommodate traffic in opposite directions, but it has been found not only that two narrow roads can usually be built more cheaply than a single wide road but that there are fewer accidents, for collisions are impossible. A narrow side-hill cut can often be made entirely in earth where a wide side-hill cut would run into rock. Moreover, where the traffic is entirely in one direction, sharper curves can be used.

Details of Milling and Smelting

Golden's Converter Tuyere

The converter tuyere shown in the accompanying drawing was devised by George D. Golden[1] while working at the United Verde Copper Co.'s old smelting plant at Jerome, Ariz. The construction was patented (U. S. No. 1,229,938, June 12, 1917) by Mr. Golden, who gives some particulars regarding its construction. The device is intended to provide an improved tuyere which may be quickly and easily removable, this being accomplished by placing an inner tube in the tuyere, capable



GOLDEN'S INNER-TUBE CONVERTER TUYERE

of independent removal without injury to the converter shell. Mr. Golden states that permission was secured to experiment at Jerome with two 2-in. tuyeres placed at the center of the converter, the remaining 14 tuyeres of the converter being of the original kind, made of 1½-in. pipe. Within the two 2-in. tuyeres were placed 1½-in. pipe running the full length of the tuyere and connecting with the wind box in such a manner as to allow the blast to pass between the inner and the outer tube; also through the inner tube. After the converter was burnt out and the brick all gone from around the 14 original tuyeres there still remained 6 in. of brick around and between the two 2-in. tuyeres having the inner tubes. In the event of the blast being suddenly shut off from a converter equipped with these tuyeres, it is claimed that the inner tubes can be readily removed. The inner tube is kept in a relatively cool condition by a circulation of air, and the metal which is more or less drawn within the tuyere by the hot punch rod does not stick on the tuyere; also the inner tube tends to prevent the brick from being jarred or torn away from the outer tube during punching. Referring to the illustrations, Fig. 1 shows the enlarged sectional view through the tuyere with a segment of the converter body. Fig. 2 represents a vertical sectional view on the line AA; Fig. 3 a sectional view on the line BB, and Fig. 4 a segmental perspective view of the removable inner tube removed. It will be noticed that the splitting of the end of the removable inner tube permits a method of fastening it in place and still allowing the air to circulate around the inner tube.

[1]Converterman, Humboldt, Ariz.

Hydro-Metallurgical Treatment of Concentrate vs. Smelting

BY A. E. DRUCKER*

I would like to bring to the notice of mine owners the importance of treating, when possible, all table and flotation concentrate on the spot, thereby avoiding the present high cost for marketing such material. The cost for drying, bagging, carting, shipping, sampling, smelting and deductions, refining, and other charges will vary between $9 and $40 per ton of concentrate. Cyanidation of raw and roasted gold- and silver-bearing concentrate has within the last few years saved many hundreds of thousands of dollars for various mining companies in different parts of the world. The Oriental Consolidated of Chosen, the Alaska Treadwell, the Goldfields Consolidated of Nevada, the North Star of California, the Golden Horseshoe, Lake View, Brownhill, and Ivanhoe companies of Australia, and the Waihi company in New Zealand, are a few examples. The cost for treating concentrate varies between $2 and $6 per ton, while the extraction (90 to 97%) of the precious metals by wet processes was equal and sometimes more than that allowed by the smelter.

Up to the present time several companies (Anaconda, for instance) have solved the problem of hydro-metallurgical treatment of zinc concentrate, producing electrolytic zinc direct for the market. Many old smelting methods are being gradually replaced by more economical wet methods. There is also at our disposal a hydro-metallurgical method for the recovery of marketable copper on the spot from table and flotation

*Consulting engineer, 50 Church St., New York.

concentrate. Combined roasting, acid-leaching, and electro-deposition may in the near future be a serious competitor to smelting. Such a process would cost from $3 to $6 per ton, and would effect a considerable saving over the usual methods of transporting and smelting concentrate.

First Water-Jacket Blast Furnace

It is usually dangerous to state that anything is the first or largest of its kind. An article appearing in this issue concerning an early copper blast furnace recalls a lengthy discussion that appeared in the *Journal*, more than 30 years ago, as to the original inventor and date of invention of the water-jacket furnace for lead and copper smelting. During 1885 and 1886 a number of letters on this subject were received from Messrs. Harnickel, Rolker, Courtis, Kleinschmidt, Williams, Hahn, Howe, Arents, Douglas, Daggett, Curtis, and Tew. Two of these communications are here reproduced:

(From the *Engineering and Mining Journal*, Sept. 12, 1885, p. 180)

In your issue of the 22nd of August, you speak of Balbach's Works, at Newark, N. J., in 1873, as being the probable place and time of the first use of the water jacket. About the year 1865 the father of the writer, Mr. John Williams, then manager of the Portage Lake Smelting Works, at Houghton, Lake Superior, erected a number of water-jacket cupola or blast furnaces for experimental smelting of the Calumet ores, and these furnaces are the first erected to my knowledge. If there are records of any earlier water jackets, I should be interested to learn of them.

J. J. WILLIAMS.

San Francisco, Calif., Aug. 31.

(From the *Engineering and Mining Journal*, Nov. 7, 1885, p. 318)

In response to your inquiry regarding water jackets in lead smelting I would say that in the summer of 1872 I made drawings for a set of cast-iron water jackets. They were made in Council Bluffs, and set up and started at the Winnamuck Works, in Bingham Cañon, Utah, then in my charge, in the fall of 1872—just what month I cannot state.

Their introduction cannot be attributed, notwithstanding Mr. Hahn's suggestion, either to the drawing of the Raschette furnace in Percy's *Lead*, as that work did not form a part of my library till 1873, or to the pamphlet of the McKenzie cupola and blower, which, as I now recollect it, was for an iron-foundry cupola not water-jacketed at all. The idea originated with Mr. Meyers, then my foreman, and myself, and was simply the outgrowth of necessity, to avoid too frequent interruption for repairs.

In the year 1875 I saw in successful operation at the Muldenerhütte, in Freiberg, a large (62 tons of material a day) furnace with wrought-iron water jackets, which I was told had been put in during the latter part of the year 1872. The above are the first uses, so far as I know, of water jackets in lead smelting. In the years 1873 and 1874 they were introduced into the Flagstaff and other works in Salt Lake Valley.

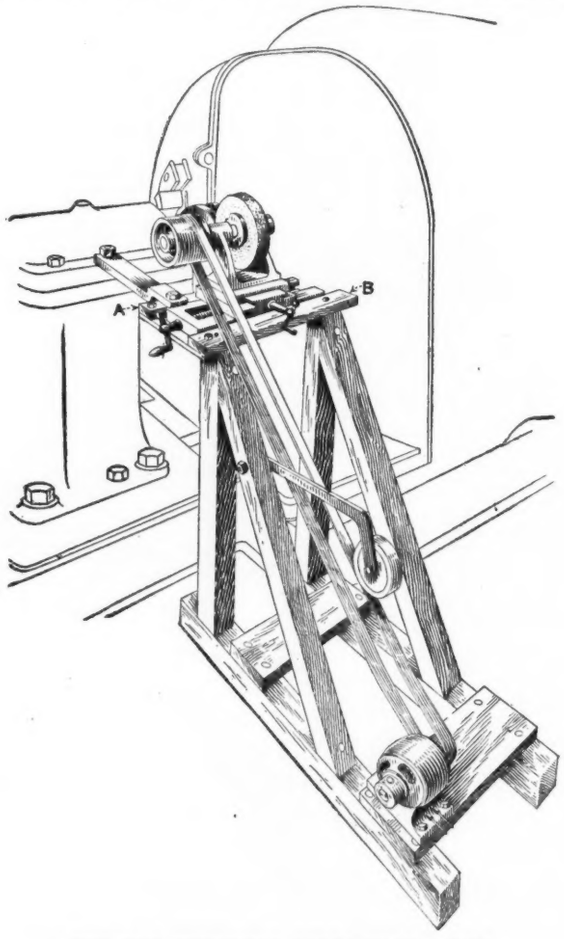
ELLSWORTH DAGGETT.

The question attracted some attention at the time, in view of royalty claims made by J. V. Woodhouse, of Missouri, as noted on p. 61 of the *Journal* of July 25, 1885. The claims were made by virtue of U. S. Pats. No. 115,921, dated June 13, 1871, and No. 168,440, dated Oct. 5, 1875. A test case was brought against the Colorado Iron Works. In corroboration of Mr. Daggett's claim there may be cited the fact that he made definite mention of a "water tymp" in describing the Winnamuck furnace in an article appearing in the *Journal* of July 1 and July 8, 1873. The main design was after the Pilz furnace at Eureka, Nevada, erected by C. von Liebenan in 1870. Until further testimony is advanced, it may be assumed that the Williams furnaces in Michigan were the first of their kind in the United States.

Grinding Collector Rings on Turbo-Generators

An arrangement for grinding the collector rings on a turbo-generator, etc., is shown in the accompanying sketch published in *Power*, Oct. 2, 1917. This consists of a frame made of 2 x 3-in. stock. An extension piece *A* is secured in place by two cross-irons and bolted securely. This headpiece forms a bed for the emery-wheel carriage, the body of which is bolted in place between the headpieces *A* and *B*. The emery-wheel carriage is moved endwise by means of a threaded rod that screws into a thread hole in the bottom of the carriage body. A cross movement for the bearing body is obtained in a like manner. In fact, the lengthwise and crosswise movement is practically the same as the cross feeding is accomplished on the cutting tool of a lathe.

When the collector rings require regrinding, as they do frequently because of the flat surface that forms opposite the wire connection, the rig is placed in position and an iron brace is bolted to the bearing cap by one of the cap bolts. This brings the 7-in. emery wheel close to the collector rings, and further adjustment is had by the hand-feed screw. On the base of the frame a ¼-hp. motor is secured and belted to the 12-in. diameter, 12-in. wide, flat-face pulley on the emery-wheel shaft. In order to provide for a back-and-forth movement of the emery wheel, an idler pulley is used to take up the slack of the belt.



RIG FOR GRINDING COLLECTOR RINGS

Events and Economics of the War

The Teuton drive into northern Italy continues. The Italians, after attempting to hold their positions at the Tagliamento River, have again been obliged to fall back, having lost to date 200,000 men and 1800 guns—which losses are mainly workmen and machine guns, according to word from Rome. French and British troops are moving to their aid. The embargo here has been modified to permit Italy to obtain much needed supplies. The Germans have fallen back a mile in the Aisne sector, being closely followed by the French forces. A German cruiser and 11 patrol boats were sunk by the British in the Cattegat. Norway has protested to Berlin against the sinking of her ships by U-boats. A German uprising in southern Brazil is reported.

In this country little of importance has happened during the week. Francis S. Peabody has been appointed to administer the Explosives Act. A Federal board has raised the wage scale from 10 to 30% for shipbuilders on the Pacific Coast. Strikes have occurred at 21 Kansas coal mines and among oil workers in the Texas-Louisiana field. The American transport "Finland" was torpedoed on her return voyage, but succeeded in returning to a European port.

Food License Plan in Operation

The licensing system through which Food Administrator Hoover purposes to control the price of food to the consumer is now in effect. The Food Administration has so complete a control over the manufacturer, the wholesaler and the jobber that it is possible indirectly to govern the prices and practices of the retail dealer. This is the first important step in the campaign to keep prices of all fundamental foodstuffs at their normal levels throughout the United States. The manufacturer is prohibited from selling above a certain price and the wholesaler and jobber likewise may not sell at exorbitant prices on pain of losing their licenses. Control over the retailer is obtained by forbidding the wholesalers to sell to any person or firm which is charging more than a legitimate retail price to the ultimate consumer.

Over 40,000 licenses have been applied for, of which number 18,000 have been prepared for issue. The purposes of the licenses are: Limitation of the prices charged by every licensee to a reasonable amount and prevention of speculative profits on a rising market; movement as rapidly as possible of all foods to the consumer; limitations of dealings in future contracts. Persons who have applied for licenses may continue to operate, unless advised to the contrary, on the assumption that the licenses are in process of issuance. Those who have not yet applied are counseled to do so at once, and thus escape penalty for failure to comply with the rule governing applications. Retailers doing a gross business of more than $100,000 annually must take out licenses as well. The regulations are to be issued in pamphlet form to all dealers licensed, and will be sent with the licenses. The Food Administration plans to keep in close touch with the operations of all licensees through a system of monthly reports. These will include statements as to the volume of business done and the amount of stock on hand at the beginning of each month.

New War Taxes in Effect

Many new taxes imposed by the War-Revenue Act went into effect on Nov. 1. They include:

One cent on each dime paid for amusement admissions.
Three per cent. on payments for freight transportation.
Eight per cent. on passenger fares except for commuters traveling less than 60 miles per day.
Ten per cent. on payments for Pullman and similar accommodations.
Five per cent. on oil pipe-line transportation.
One cent for each 20c. or fraction paid for express packages.
Five cents on each telegraph, telephone or radio message costing 15c. or more.
Various taxes on cigars, cigarettes, tobacco and products.
Ten per cent. on club dues and lodge fees that are $12 per year or more.
Eight cents on each $100 of new life insurance.
One cent on each dollar of premiums paid on fire, marine, casualty and other insurance policies.

Increases in first-class mail rates probably will be most generally felt by the people. The law provides that the postage on letters except "drop" or local letters shall be 3c.; and that on postcards, including private mailing cards, shall be 1c. more than heretofore. This increase includes picture postcards. The advances are construed to begin with letters and postcards postmarked Nov. 2. Other taxes of the new law, including those on hard and soft drinks, incomes and war-excess profits, have been in effect since the law was approved Oct. 3, but in indirect form. On Dec. 1 the new stamp taxes, including those on parcel-post packages, will be payable, putting the entire law into complete operation, except for increased rates on second-class mail, postponed until July 1 next.

Business Votes on Price Control

Sentiment on the part of business men throughout the country for legislation permitting fuller price control by the Government during the war has been indicated by the vote cast in the referendum recently conducted by the Chamber of Commerce of the United States through its constituent bodies. On the question of whether there should be additional price-controlling authority during the war the favorable vote was 974, 110 votes being cast in the negative. The organization voted 978 to 116 that authority to control prices should be extended to all articles of importance in basic industries and to those necessary in everyday life, and also that price control should extend to the prices the public has to pay as well as to those that the Government pays. The proposal that price-control authority should be vested in a small board appointed by President Wilson was supported, as was the suggestion that an

agency working with such a board should have power to distribute available supplies where they would most benefit the public. It was also voted that each leading industry should have a representative to advise with price-control and distribution agencies.

Organizing the Alien Property Bureau

By executive order the President has vested A. Mitchell Palmer with full powers as Alien Property Custodian, requiring him to give bond in the amount of $100,000, fixed his salary at $5000 a year and allotted money for carrying out the Trading-with-the-Enemy law. Mr. Palmer is authorized to form whatever organization he deems necessary, to designate depositaries for property taken through the operation of the law and to require these depositaries to execute bonds. Any banks or trust companies may be named by Mr. Palmer to receive stocks, bonds, notes, time drafts, bills of exchange and any other securities or properties except money, checks and demand drafts of enemy aliens and allies of enemy aliens. Money was allotted to the Treasury Department, the Federal Trade Commission and the War Trade Board by the executive order for the investigation work they will do for the Alien Property Custodian. The sum of $100,000 was made immediately available for the direct use of Mr. Palmer's organization. The time in which reports must be made to Mr. Palmer of property and money which should come into his custody has been extended until Dec. 5, owing to the delay in the custodian's appointment.

J. Lionberger Davis, president of the Chamber of Commerce of St. Louis and vice president of the St. Louis Trust Co., has been named as Mr. Palmer's chief assistant. Mr. Davis will be known as managing director of the Alien Property Bureau. In reality he will be president of what will virtually be an enormous trust company formed under the administration of Mr. Palmer. It is estimated that the property of enemies and alien enemies of which the Alien Property Custodian will take charge will reach $1,000,000,000. Mr. Davis will be in effect the president of the largest trust company in the world. Ralph Stone, of Detroit, Mich., was appointed trust officer and will assist Mr. Davis. He is president of the Detroit Trust Co., one of the largest financial institutions in Michigan.

Conscription of Labor for War Work

The National City Bank of New York in its November bulletin directs attention to the necessity of curtailing private work in order to fill the requirements of the Government, which will necessarily be large, as indicated by the $20,000,000,000 of war appropriations made by Congress.

"The available supply of labor," says the bank, "is limited, and competition for it increases costs without increasing product. The payment of extraordinary wages will attract labor to the war industries, but if it is drawn from coal mines, railways and farms the situation may be so disorganized that even war work will be impeded. The situation is most effectually handled by having the Government exercise priority rights. It is doing this as to materials and equipment, and may have to go further and exercise a priority right to labor If conscription for Government work is deemed impracticable, the object may be accomplished by restricting the employment of labor in non-essential industries."

The imminent necessity of speeding up ship construction was emphasized at a conference on Oct. 29 between Atlantic Coast shipbuilders and officials of the Emergency Fleet Corporation, the Navy Department, the Department of Labor, and the American Federation of Labor. The labor question was discussed in detail, special consideration being given to feasible methods for attracting skilled workers to shipyards. Unless the present labor shortage is relieved without delay, officials may consider methods of conscription.

New Railroad Laws Proposed

Federal regulation of the issuance of railroad securities and additional recommendations for further railroad legislation were indorsed by the affiliated trade and commercial organizations of the Chamber of Commerce of the United States, in a referendum just concluded. The vote strongly backed up a report of the Chamber's railroad committee. Other proposals indorsed were: Passage by Congress of a general railroad incorporation law under which all railroad carriers subject to the jurisdiction of the Interstate Commerce Commission may organize, compulsion of carriers to organize under such law, and recommendation that the Interstate Commerce Commission be given authority to regulate intrastate rates when those rates affect interstate commerce.

Norwegian Nickel for Germany

Germany is soon to receive large quantities of nickel from a plant in Christiania, Norway, for use in manufacturing torpedo tubes, according to information that has reached Washington. The Christiania factory is about to resume operations and beginning in January is expected to deliver 100 tons of nickel a month to the Germans, to whom it will be of great military value. This source of nickel supply has been cut off for some time. Norwegian papers are expressing dissatisfaction that Germany is to receive such aid, in view of the sinking of Norwegian ships by U-boats.

Enemy-Owned Patents Thrown Open

About 20,000 articles covered by patents and copyrights owned in Germany are affected by the order of the Federal Trade Commission prescribing the rules for licensing their manufacture by citizens of the United States, in accordance with the provisions of the Trading-with-the-Enemy Act. These include dyestuff formulas of vital importance to American industries and mechanical devices of wide use, though the humanitarian effect of the order attracts the widest attention. German thought for many years has been in the forefront of medical research, evolving remedies for disease and for alleviation of pain, all of which that are patented in the United States will now become available in this country. Whether prices for drugs so manufactured under license will be determined by the commission was not announced, but it was intimated that it would safe-

guard the public against exploitation. Prices of drugs have greatly increased since 1914, many remedies costing ten times as much as formerly.

Losses of German Mercantile Marine

According to the German periodical *Weltwirtschaft*, says the *Iron and Coal Trades Review* (British), the number of German merchant ships lost during the war, and their gross registered tonnages are as follows: Taken at sea, 74, tons 187,000; seized in British ports, 182, tons 456,000; French and Russian ports, 94, tons 143,000; Italian ports, 39, tons 172,000; Portuguese ports, 75, tons 227,000; American ports, 88, tons 630,000; Brazilian ports, 46, tons 236,000; Greek ports, 9, tons 18,500; Japanese ports, 12, tons 24,500; Chinese ports, 11, tons 22,000; total, 630, tons 2,116,000. The list is not complete, as it does not include the nine ships of a total of 19,000 tons, seized by Siam, and probably the number and tonnage of ships seized by China have been understated. Moreover, according to another source, the number of German ships seized by the United States was 101, and their tonnage 636,039 tons. The aggregate tonnage of the German merchant fleet before the war is stated to have been 5,459,296 tons.

Many War-Device Patents

War has caused an anomalous situation in the Patent Office at Washington, where the number of applications for patents on war devices increases daily, and the fear of giving valuable information to the enemy is causing the withholding of patent rights to scores of inventions. The Patents Commissioner's Office has announced that within the last few weeks patents have been refused to about 60 war inventions, acting under the recent law giving the Federal Trade Commission and the Patent Office authority to prevent publication of information concerning patents that the enemy might use.

A corps of West Point and Annapolis graduates, trained in the technical problems of war, scan the thousand or more patent papers issued weekly for details of military significance, and choose those on which patent proceedings should be suspended during the war. Inventors thus deprived of patent rights may offer their devices to the Government, and sue after the war for compensation.

Prices Fixed for Mine-Run Coal at Docks on the Great Lakes

The prices at which various grades of coal shipped to the docks situated on Lake Michigan and Lake Superior may be sold have been announced by the Fuel Administration. These docks are not classed as jobbers or retailers, and hence the rules heretofore promulgated do not apply except to a small proportion of retail business done at the docks to accommodate local consumers. The bulk of the coal goes to the Northwest and comes from Lake Erie ports. Ordinarily it is received as run of mine, screened and separated into the several sizes by the dock companies before forwarding by rail. The prices announced include the cost of coal at the mines and of transportation by rail to the Lakes and thence by vessel to the docks. For run of mine (or run of pile) the prices range from $6.20 to $7 per ton, the customary differentials being made for lump and screenings. It is estimated that for the remainder of the season 2,292,000 tons shipped for domestic purposes alone will be affected by these prices, resulting in a saving to the domestic consumers of the Northwest for the present year of $1,200,000.

Concrete Ship Launched in Norway

A dispatch from Christiania to a London paper says: "The first Norwegian iron and concrete ship was launched at the Porsgrund Cement Works in the presence of the Prime Minister, M. Knudsen. The ship is built on an entirely new system, with the bottom upward, in which extraordinary position the launching took place on a sort of underlying sledge, which glided out with the ship.

"When the water was reached the hull became detached from the sledge, gradually sank up to a certain point and then subsequently righted itself. This particular ship, which is of 200 tons burden, was built in three weeks, but the next will only require about half that time, as the original frame will be used for each subsequent ship of the same size. The casting of the ship, when the frame is completed, will this time take only two days. It is intended to start the wholesale building of iron and concrete ships of 200, 500 and 1000 tons. A 1000-ton ship will be completed in six weeks."

Export Embargo Raised for Italy

All export restrictions will be waived by the Government in forwarding supplies to Italy to aid in meeting the Austro-German invasion. The Italian government is to be permitted to take the kind of materials needed most to the limit of its tonnage capacity, regardless of prospective shortages here. Request has already been made for 2,000,000 tons of coal and has been granted without hesitation by the Fuel Administration. Approximately 100,000 tons of shipping has been promised Italy by the Shipping Board. The shortage of ships is so serious, however, that the Board has to pick them up as it can find them, and the whole amount of tonnage promised may not be available under 30 days. The shipping the United States is able to release will be totally inadequate to meet the demand for coal and to carry food and ammunition.

F. S. Peabody Appointed to Enforce Explosives Law

Francis S. Peabody, Chicago coal operator and chairman of the Committee on Coal Production of the Council of National Defense, has been appointed assistant to the Director of the U. S. Bureau of Mines to enforce the law regulating the manufacture, sale, storage, and use of explosives which becomes effective Nov. 15. Strict enforcement is expected to prevent to a great extent dynamite outrages and incendiary fires by enemy sympathizers or agents. Mr. Peabody will receive a salary of $1 per year.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

Mediation Commission's Report on Warren District

From Bisbee, Ariz., the Mediation Commission telegraphed the President on Nov. 7 as follows:

"The President's Mediation Commission found conditions different in the Warren copper district from those that prevailed in the other camps visited. In this district are the large mines and smelteries of the Copper Queen and Calumet & Arizona companies, with a normal output of about 17,000,000 lb. of copper per month. So far as the immediate output of copper is concerned, the Commission found the situation satisfactory. The strikes in the Globe-Miami and the Clifton-Morenci-Metcalf districts resulted in a substantial shutdown of the mines. Federal intervention was needed to secure resumption of operations. Here the strike called on June 26, which materially affected the production in the district, was broken by the deportation from Bisbee on July 12 of 1186 men.

"The task that confronted the President's Mediation Commission was therefore not to secure a mere resumption of operations but to insure continuation of operations during the period of the war in Bisbee as in the other camps. The strike came to a head because of the lack of a proper mediation board whereby the grievances of the employees could find adjustment through an orderly process of adjudication and a decision made by some final disinterested tribunal in whose fairness both sides would have confidence and before whom the rights of each would have equal weight. The Commission has launched a plan of settlement that has been accepted by the companies and provides for the establishment of grievance committees at each mine, the members of which are to be selected entirely by the men, by and before whom all grievances must in the first instance be presented. In a case where just redress be denied, the grievance committee may make appeal to the United States Administrator appointed for the purpose of supervising the operations of the settlements made by commissions in the entire district. Claims of discrimination against union members have been particularly insistent in this district and hereafter such discriminations are prohibited, and the enforcement of the prohibition is vested in the United States Administrator. Thus there is an assurance of effective means by which all questions in dispute between the companies and the men can be promptly and justly settled under the impartial supervision of Federal authority. Resort to strikes, for the period of the war, at least, is therefore unnecessary and will not be used by the men.

"There is every basis for assurance that the copper production of this district will be continued without interruption by labor difficulties. The President's Commission could not make provisions for the future copper production of the district without inquiry into the Bisbee deportation of July 12 and the events that preceeded and followed. The result of this inquiry will shortly be embodied in a report to President Wilson."

Hookworm in California Mines

Stamping out the hookworm infection among miners of the Mother Lode district of California is essential to the material prosperity of that district, according to Dr. James G. Coming, director of the bureau of communicable diseases of the California state board of health, and Joseph H. White, sanitary engineer with the United States Bureau of Mines. Inasmuch as 50 to 80% of the men working in the mines are infected, drastic recommendations for eradicating the disease have been drawn up. The possibility of the infection being spread by mine rats has received attention.

Potash Prospecting in the Southwest

The extension of wildcatting for oil into the Red-Beds zone of the Southwest will facilitate the prospecting for potash. More than 60 holes in that region are projected, states N. H. Darton of the U. S. Geological Survey, who has just completed a trip through the section. Having failed to discover potash at Cliffside, Tex., the Survey will direct its energies to a careful examination of the drill cores coming from 25 wells which are being sunk in the area favorable to the occurrence of the salt. This policy will be pursued at least until drilling materials are lower in price and more available than at present. Government chemists are testing the cores from the wells and will endeavor to make tests wherever new holes are started. Accurate drill records will add to the knowledge of underground geology of a section about which little is now known.

Abrogation of Contracts Interests Federal Trade Commission

The Federal Trade Commission has made the following request of various members of the iron and steel industry:

> The commission would be pleased to receive from you an expression of opinion, in case prices should be fixed by law, of the advantages and disadvantages of providing that prior bona fide contracts for materials and for products bought and sold should be abrogated. In connection with any opinion, statistical data in support of your views are desired.

The Commission, it is said, has taken no stand on the question of abrogation of contracts, but is simply gathering information on the subject, in case Congress may call for it when the Pomerene bill or similar measures are taken up. Since Congress frequently takes action that destroys the effect of a contract there are prominent lawyers in Washington who maintain that contracts may be abrogated without conflicting with the constitution.

Concentration of Wulfenite and vanadinite ores is the subject of study at the mine experiment station of the United States Bureau of Mines at Golden, Colorado.

Editorials

Mining in Russia

SOMETHING seems to have gone wrong with the developments at the smelting works of the Irtysh Corporation at Ekibastus, in Siberia, for the zinc smeltery which was put in operation in the latter part of 1916 has been unable to increase its output, which was only about 50 tons per month during 1917. According to the last report of the technical committee of this company, the smaller of the two blast furnaces of the lead smeltery was expected to be put in commission early in 1917, and the larger one during the summer; but up to the beginning of September no lead was reported produced. It is to be noted also that the monthly reports show diminishing outputs of the Ridder and Sokolni mines and of the collieries. Similarly we get reports of decreased production from the Spassky copper mines.

The true explanation of this is unfortunately to be found in the political and economic troubles of the country. The workmen have practically taken possession of the mines and works, even those owned by foreign companies. The titles to the properties remain with their owners, but the workmen have so enforced their demands for higher wages as to preëmpt all profits. This is an injury to the companies. But the workmen go further and by their repudiation of discipline, their refusal to work hard and their ousting of the foreign technical staffs they let production fall off and so injure their country. The foreign administrative officers are so shorn of their authority that some of them have left the country in disgust, while others remain at their posts, hoping that their workmen will come to their senses when they learn what a mess of things they have made. At present, however, the workmen regard these officials as high-priced excrescenses, who draw more than their share from the business. This follows from the socialistic theory that all workers ought to divide equally.

These experiences in Russia are simply in line with the childishness that is permeating the masses all over the world. The child ignoring advice is not satisfied until he has torn a clock to pieces to find out how it works, and the only way he can be convinced that he ought not to touch a red-hot stove is to try it. Similarly our representatives in the Congress of the relatively enlightened American people reject expert advice and enact a disastrous revenue bill so that they may see how badly it will work. We cannot criticize the Russians too severely for being more childish than we are. However they are affording us some useful object lessons.

The Irtysh Corporation, for example, went into a remote part of Siberia and with financial boldness and the intelligent use of expert knowledge acquired an orebody that previously was of no good to anybody. It developed mines and erected concentrating mills and lead and zinc smelteries. The boldness, resourcefulness, and patience of anybody contemplating the inauguration of zinc smelting in such a remote region can be appreciated properly only by those who are experienced in the art. The Irtysh Corporation had not yet consummated its plans when the revolution came, but turning to the experiences of older, dividend-paying mining enterprises in Siberia, which had similarly created new industries furnishing employment to the population, we observe a virtual confiscation of them by their employees, who are finding, however, or soon will find, that they have grasped but a shadow, for in their hands the properties that previously yielded profits cease to do so. In their ignorance they discarded the managements—the brains—that made these properties valuable. In their eyes the managements consisted merely of high-priced officials, and they had no idea that those officials received high salaries because they *earned* them many fold.

The program of the I. W. W. in the United States, which fortunately was scotched, was similar. In the recent strikes in the copper-mining districts there was a demand for a six-hour day. It was useless for the administrators to argue on that subject with the agitators, for the latter said openly that if they got a six-hour day they would then demand five hours, and would continue their demands down to two hours and to what would be virtually confiscation of the mines. Then we should have had the same disappearance of profits as in Russia, and eventually our greatest orebodies would have been no more valuable than the rock of Pike's Peak.

Look at the great mines of the day and consider what they would be without brains. The entire group of porphyry coppers would be simply worthless rock peppered with a little copper had it not been for the genius of Jackling in leading the way. Anaconda, which towers above everything else in the excellence of its metallurgy, and is one of the most profitable of all mining enterprises, would be decadent had it not been for the hierarchy of able administrators who in 20 years of work have made it the Mecca to which metallurgists from all over the world go for inspiration. Calumet & Hecla, the pride of Boston and Lake Superior, would also have been decadent had it not been for MacNaughton. The zinc deposits of Broken Hill might still have been the baffling problem that they had been for a quarter of a century previously if Hoover had not solved it. In all of these things capital has played a great part, but, after all, only a subordinate part. It was no great feat for the Guggenheims to supply $15,000,000 for the development of Chuquicamata after Yeatman had worked out the engineering and Cappelen-Smith the metallurgy. But in general the capital for such undertakings has been supplied not by one group of rich men but by the subscriptions of many thousands of people—whom the Bolsheviki contemptuously call the bourgeois class—who by thrift have saved it out of their earnings. The workmen who think that the industries in which they work ought to belong to them have the same right to buy into them that others have had and have exercised.

The Decline in the Stock Market

FOR nearly a full year the stock market has been a declining one. During the last month the decline has been all but cataclysmic. Many seasoned stocks have fallen below the levels when the Stock Exchange was closed in July, 1914; below the levels of the panic of 1907. Railways, industrials and bonds of all kinds have shared in the decline. Values have ceased to cut any figure. The shares of one large steamship company have sold for less than the equivalent of the cash and Liberty bonds in its treasury. What is the reason for this? The best explanation, we think, is offered by the accomplished financial editor of the *Evening Post* as follows:

> The severe and continuous fall in stocks on this occasion does not necessarily mean, as it has almost invariably meant at other times, a similar reaction in general industry. It certainly does not mean, as in 1907 or 1904, that institutions or individual capitalists are facing embarrassment. Nothing of the sort is even intimated. The production and earnings statements on the one hand, and the Liberty Loan subscriptions on the other, completely dispose of any such supposition. What it manifestly does mean is that the enormous and (relatively speaking) very sudden burdens, imposed on both institutions and individuals by the Government's finance plans, have left large holders of investment securities in great bewilderment as to how far they will presently be obliged to have cash in hand instead of securities. The process of converting the one into the other has been carried on with needless haste, but of its existence as a cause there is no reasonable doubt. Naturally, the liquidation thus occasioned has influenced prices more emphatically because so great a part of the whole community's available capital is at the moment tied up in war-loan subscriptions.

By the Government's finance plans is meant, of course, not only its borrowing program, but also its taxation. Too little attention has been given to the retroactive character of the latter, the bill that was passed imposing an enormous burden upon a year whereof three-fourths has already passed, the earnings accumulated during that period having been previously appropriated. Moreover, the confusion is increased by the continued absence of knowledge as to what the taxation under the war profits chapter is really to be and the recognition that it remains for the Bureau of Internal Revenue to determine the rules. With these conditions as a basis the stock market declined first for reasons that were practical and later for reasons that were partly psychological. The absence of buying power has been conspicuous all along, but there would have been buying power had not the downward movement gained such impetus that many people who appreciated that securities were low would not buy in view of the probability that they would go lower. What, then, is to produce the change of mind that will check the decline? As to this the *Post* proceeds:

> As to what is to be or can be the remedy, Wall Street is undoubtedly in a state of unusual perplexity. It must be said first and positively, however, that fixing of minimum prices would not help the situation any more than would, say, the closing of the Stock Exchange. Such expedients disguise symptoms while they greatly aggravate the malady and they are really warranted only in a sudden and overwhelming crisis of an entirely different sort from the present position. A great victory in the field would certainly help. Beyond question, and irrespective of close points of theoretical controversy, the granting by the Interstate Commerce Commission of the higher rates asked by the railways would do it. Action in this matter, moreover, ought to be very largely influenced by the fact that the railways are now vitally important factors in the Government's war plans, and that the maintenance of full efficiency is as essential in its way as maintenance of the army. Whether it is possible, through the executive messages and reports or through the proceedings of next month's Congressional session, to start machinery for a war-taxation programme more orderly and scientific than the set of schedules which the late conference committee left to the perplexed and bewildered taxpayer—this is a larger question. Any step in that direction would, however, touch the heart of the present difficulty. This would not be because it would be taken to mean reduction in the burden of taxation—no one anticipates that. But it would at least give ground for hoping that the many and disturbing results which have been feared from the present experimental statute might be properly corrected.

It seems certain now that relief is to be granted the railways, the Administration, through the Comptroller of the Currency as a mouthpiece, being in favor of this, and the shippers who heretofore have contested the demands of the railways having withdrawn their opposition. Favorable action by the Interstate Commerce Commission is therefore expected.

The Price of Lead

THE cut in the price of lead to 5½c. stimulated buying and during the week following transactions were far in excess of the normal. It is generally a good policy in such a declining market as was being experienced in lead for some big interest to take the bull by the horns and cut the price to such a low figure that buyers cannot fail to be interested, after which the market has a chance to build up again. The cut to 5½c. was immediately recognized as being probably a bedrock price. If the buying power of our dollar be now only two-thirds of the normal, and there is much evidence in support of that view, 5½c. for lead now is equivalent to only 3.6c. previous to the war, and we know that lead never continued long at so low a price. A price of 6c. now may correspond with 4c. formerly.

The first burst of buying last week was manifestly to a large extent to replenish the depleted stocks of distributers. Whether real consumption is to be revived remains to be seen. It is well known that the use of white lead was curtailed in 1916 and probably there was further curtailment in 1917. That means that a great deal of painting was deferred, even where it was really necessary for the maintenance of property. A lower price for the pigment should have the natural effect of increasing consumption for this purpose.

The report of the Federal commission that went to Arizona to settle the strikes in the Globe-Miami and Clifton-Morenci districts appears to contemplate that the workmen may be entitled to an increase in wages owing to increase in the cost of living, but that the companies may not be able to grant it if they cannot get more than 23½c. for their copper. This is simply what the companies have said, namely, to the demands of the men they replied *non possumus*. If the men could not afford to work at the old scale of wages the companies would have to close their mines, which they proceeded to do. However, Clifton-Morenci is one of our major copper producing districts, and its copper is needed. This situation confirms what we have previously intimated, namely, that the price of 23½c. for copper is not sufficiently high to maintain the necessary production. If things had been left alone by Washington we should have had higher prices for copper for a while, higher wages that would have attracted miners from the

lead- and zinc-mining districts, where they are not needed, an abundance of copper and eventually a superfluity, just as in the cases of lead and zinc. Washington lacked both perspective and patience.

BY THE WAY

Hayden, Stone & Co. say: "The point of view of raising money by expansion, if need be by inflation, rather than contraction and confiscation, has not received all the attention it deserves by the powers that be, but we believe its truth will gradually be better realized. Indeed, there are already some signs of this; for instance, the invitation to reopen the railroad-rate case."

The high price of silver has caused the reopening of many old mines throughout the world. Some had been idle so long that they were considered thoroughly dead. That mining activity may often be directed along peculiar lines is illustrated by a dispatch printed in the New York *Sun*, which says that at Honolulu, in the territory of Hawaii, the police discovered on Nov. 1 that the tomb of King Lunalilo had been broken open and his silver crown and other emblems stolen. King Lunalilo died in 1874, and was the predecessor of the late King Kalakaua.

Some years ago a noted plainsman of the Southwest, a resourceful, adventurous spirit, was speaking in depreciation of technical education, says *Power*. Time and money devoted to such a thing, he argued, might be expended to better purpose. The "school of hard knocks" was nature's polytechnic, and it alone could qualify a boy to meet successfully the duties and exigencies of life. When his companion ventured the opinion that while any man with tools and material and a modicum of native wit could build a shack that would answer very well as a protection against the elements, no one in his right mind would undertake elaborate plans and specifications for a modern skyscraper without first qualifying himself in a thoroughgoing way for that character of work. "W-e-l-l," said the old plainsman, "well, maybe not a skyscraper, but there is no sense in putting up such high buildings anyway."

In the early days of Michigan mining the cost sheets did not entail the elaborate accounting that is required by present-day methods. Nevertheless the operators demanded some form of statement showing the expense under which the mine was producing. The following is related, as occurring at one of the Menominee range mines: The mining captain, a Cornishman, received word from his head office to send in some information on costs. So the first of the month he said to his bookkeeper, "Jimmie, m'son, 'ow's the costs commin'?" "A little high, Captain, a little high," replied Jimmie. "Little 'igh, be they. Well, m'son, I'll tell 'ee wot thee better do. Jus' pull out price o' that great roll 'oistin' rope thee's got in ware'ouse." And the month's accounts went in with a fair mining cost. Next month—"Jimmie, m'son, 'ow's cost this month?" 'Well, Captain," said Jimmie, "They're pretty low and the boys did fine." "Um-m, low be they. That'll 'ardly do, m'son. Dam-me, I think thee'd better charge up that there bit of 'oistin' rope."

We read that the chairman of the War Industries Board visited the President last week to obtain his decision respecting the price for nails. It is mortifying that our commander-in-chief, the head of our nation, who has more actual power than any king and any premier of Europe, is obliged to concern himself with such details. But we wonder why the President gave no attention to the recent deliberations of the Conference Committee of the Senate and the House, which dealt a blow to the business affairs of the country and according to one financial student "did more damage to the cause of the Allies than did the Russian socialists in the destruction of all government in Russia and in the break-up of Russia's defense."

Percy Creampuff Eclaire is at his old tricks again. Yes, indeed, the same Percy that wrote "The Bungle Book" about the awful conditions at the corned-beef foundry. This time Percy seems to have been hobnobbing with a bunch of coal-mine employees who never heard or even half appreciated what a jolly, old soul is old King Coal when his fiddlers observe the rules of harmony. When an author puts on red goggles and inks his typewriter with bile it is silly for anyone to look in the product for a rational presentation of facts. Those who prefer to think that the chief delight of capitalists is to make miserable the lot of the workers would derive great comfort from such a book. Responsible mining men who read it would do so only through curiosity to learn the nature of another new poison gas. "King Coal," through a curious coincidence, happens to be a new book written by somebody named Upton Sinclair. As we never heard of him as a mining man, the title may be misleading.

I was recently talking with a man close to the British embassy at Washington, says a writer in the *Boston News Bureau*, and he said: "Nothing the British government could ever do would be too much for the house of Morgan. Their business was done for us with extraordinary rapidity, accuracy and economy. They shipped us steel, copper, and everything else in a most magnificent manner. That Stettinius buying organization was a wonder; Stettinius put his cards right on the table and was fair to both buyer and seller and he saved us both time and money but the saving in time was the great thing for us. It is a pity that that great organization is not today working for the United States and all the allies. As to profits, I do not think Morgan ever thought of them. They were inconsiderable, never above 1% and later much less, but Morgan was not in it for profit. Many months ago, they asked us to release them, which we were very sorry to do." Lord Northcliffe says: "Mr. Morgan saved the British nation hundreds of millions of dollars by clever buying and aided the success on the Western front by the splendid way his firm financed munition plants. I regret they are no longer British government's purchasers. The buck was passed to me."

Spelter Production, Jan. 1 to Sept. 30, 1917

As the result of a canvass by the U. S. Geological Survey to ascertain the production of spelter in the United States during the third quarter of 1917, C. E. Siebenthal estimates, on the basis of returns of over 95% of the production, that the output of primary spelter from domestic ores was 132,700 short tons and from foreign ores 23,900 tons, a total of 156,600 tons, as compared with an average of 180,569 tons per quarter during the first half of 1917, 175,502 tons per quarter during the last half of 1916, and 158,226 tons per quarter during the first half of 1916. In addition to the primary spelter, the amount distilled from skimmings, drosses, etc., was 4400 tons, as compared with 6000 tons in each of the two quarters preceding. The total production for the first nine months of 1917 was 444,267 tons from domestic ores, 73,457 tons from foreign ores, and 16,550 tons from secondary materials. Returns not yet having been received from the Robert Lanyon Zinc and Acid Co., and the Clarksburg Zinc Co., it has been necessary to estimate their output together with that of two secondary plants. The stocks of spelter at smelteries Sept. 30 amounted to 47,186 tons, as compared with 33,147 tons June 30 and 17,598 tons at the beginning of the year.

The zinc content of zinc ore imported into the United States in the third quarter of 1917 was 15,000 tons, and the exports during July and August of spelter made from domestic ores were 16,800 tons and of spelter made from foreign ores 3000 tons. The number of idle retorts Sept. 30 was 64,626, or 28% of the total number of retorts, and included 18 entire plants, several of which are being dismantled. One electrolytic plant also will possibly be dismantled.

It is evident that many zinc smelters, loath to break up their labor forces while there was a probability that Governmental requirements might call for their full capacity, have continued smelting when it was no longer profitable, or even at a loss, thinking that the heavy orders expected when this country entered the war would eventually be placed; but it is also evident that this unprofitable production cannot much longer be maintained.

Potash from Cement Dust

One-half the normal consumption of potash for fertilizing can be produced from cement plants of the country, says the United States Department of Agriculture, in a recent publication.[1] That between 71,000 and 75,000 tons of available recoverable potash—about one-third of the quantity normally consumed in the United States—exists in the dust passing through or retained in the flues of the cement-manufacturing plants of the country is indicated by analyses made by the Bureau of Soils. By increasing the percentage of potash volatilized, by the addition of substances which will not affect the quality of the cement, the recoverable potash in flue dust can be increased, it is claimed, to more than 100,000 tons annually, or nearly one-half of the normal consumption of potash in the United States.

[1]Bull. 572, U. S. Dept. of Agriculture, Washington, D. C.

Numerous plants have installed electrical-precipitation equipment to recover the flue dust, and some plants are reported to be recovering 95% of the potash present in the raw materials fed into the furnaces. The dust recovered in the flue stacks, connecting kilns, and precipitation apparatus carries about 4.5% potash, while that recovered from the precipitation apparatus itself runs about 11% potash. The dust may be used as a source of cement material, may be disposed of as collected for use as a fertilizer or in fertilizer manufacturing, or may be leached to prepare concentrated potash salts.

Chronolgy of Mining for the Month of October, 1917

Oct. 1—President Wilson signed the Potash Bill.—Embargo placed by Carranza government on shipment of gold and silver from Mexico.

Oct. 5—Bill passed by Congress providing for suspension of annual assessment work.

Oct. 6—Federal Reserve Board arranged to supply necessary amount of gold to permit American companies operating in Mexico to continue, under the Carranza embargo.

Oct. 8—American Institute of Mining Engineers convened at St. Louis, Mo.

Oct. 9—Strike of Aguila Oil Co. employees, started on Oct. 4, settled.

Oct. 16—President Wilson approves site of nitrate plant at Muscle Shoals, near Sheffield, Alabama.

Oct. 17—Second furnace of Bunker Hill & Sullivan company at Kellogg, Idaho, placed in operation.

Oct. 23—Globe-Miami strike settled through efforts of labor commission appointed by President Wilson.

Oct. 24—Headquarters of Metal Mine Workers at Anaconda, Mont., raided and strike leaders arrested on the charge of interference with copper production.

Oct. 30—Labor commission arranges settlement of strike in Clifton-Morenci-Metcalf copper district, in Arizona.—Labor strike reported in Texas and Louisiana oilfields; about 9000 men went out.—I. W. W. activity in Tulsa, Okla., oil fields reported.

Mother Lode Copper Mines Co.

A report for seven months ended Aug. 1, 1917, of the Mother Lode Copper Mines Co. of Alaska, shows that the mine produced shipping ore until Apr. 10, except during a 12-day strike for a wage increase. The mine was temporarily closed following Apr. 10, pending the installation of machinery. Excavation for an underground compressor chamber and hoist room was begun on May 4, and completed at a cost of $3168. Development in the mine amounted to 212 ft., making a total of 8018 ft. The ore reserves in sight and estimated, are reported as follows: Ore broken in stopes and at millsite, 20,165 tons; ore intact between various levels, 70,615 tons; ore on dumps, 25,150 tons.

Two ore zones exist. All workings are at present in the upper zone. The lower is separated by a 500-ft. limestone strata from the upper zone. A two-compartment vertical shaft will be sunk, at an estimated cost of about $25 per ft., to the lower zone to develop ore be-

tween the 600- and 800-ft. levels. A tunnel is being driven to develop the upper ore zone at 210 ft. below the Pittsburgh Tunnel level, which will replace the present stub tramway. The length will be about 830 ft. and the estimated cost, $17.66 per foot.

A concentrator unit will be installed this year and it is planned to build a permanent mill next summer, with 200-ton capacity per day, producing about 30 tons of 50% concentrates.

The power plant is being constructed and will be equipped with a 338-hp. boiler using oil burners, and two Worthington oil pumps connected with a 10,000-gal. supply tank, fed by a 4-in. pipe line, 1100 ft. long, from the railroad tank cars at the Mother Lode spur. One steam turbine direct-connected to a 240-volt, 780-amp., two-phase alternator will be installed. The maximum output of this plant will be 300 kw. In addition, a warehouse, wagon road, aërial tramway, three double bridges, 12 single truss bridges, 16 log bridges and 34 culverts are being constructed.

Brazil May Tax Manganese Ore Exported to United States

Government officials of the State of Minas Geraes are discussing the project of imposing a tax of about 8% on all manganese exported to the United States, the tax to be put into effect immediately. The present tax levied by the State of Minas Geraes is 4%, which it is proposed to increase to 8%. It is also said that a federal tax will be levied in addition to the state tax. The manganese content on which these taxes will be based has not been learned. The American Consul General at Rio de Janeiro has been engaged for many months in an effort to facilitate the movement of manganese to the coast. In spite of the endeavors of the Central Railroad to move as much manganese as ships bound for the United States can load, the movement is often accomplished only with great delay. Last month the movement over the Central Railroad exceeded for the first time 50,000 tons.

Arrangements concluded in 1915 with some important producers of manganese, fixing for them the price of transport at six milreis a ton, will expire at the end of December. This price being a high one, it is proposed to reduce it to three milreis, and it is suggested that the buyers and producers of manganese furnish the railroad with loading facilities.

Mining Alaska Coal

The Government railway has tapped two or three producing coal sections of southwestern Alaska that are steadily improving in quality of output. According to *Coal Age*, Secretary Lane is quoted as stating that the coal fields already opened are larger and richer than the Government had at first anticipated.

Bituminous coal that is equal to the very good quality produced in West Virginia has been uncovered, and there are anthracite fields yet to be reached. Under the improved outlook the Government is to continue railroad construction, even though the expense of materials and labor is very much higher than estimated, on the theory that the saving to the Navy in using Alaska coal will more than repay the increased cost of railroad construction. West Virginia navy coal now costs $14 to $15 per ton laid down on this coast; Alaska coal of good quality can be loaded on ship for $4 or $5 per ton.

The *Alaska Railroad Record*, published by the engineering commission, indicates three coal areas now in process of development. At the Eska creek mine, bunkhouses, a powder house and primer house have lately been completed, and also a loading trestle and coal pocket for loading engines. An office building has been erected, five acres of land have been cleared, and cottages are under construction. Coal is being taken out of the Martin coal bed, and 2905 long tons were shipped to Anchorage in September. At the Chickaloon mine a crosscut is being driven and permanent improvements for mine operations are being completed. Around each of these mines a little community of schools, business houses and cottages is growing up.

It will be the policy of the Government to open the mines and get access to the coal as rapidly as possible. By late spring of next year the engineering commission expects to be able to deliver coal in substantial quantities to the Navy. With a $10 saving on each ton of coal so delivered, Alaska fuel will begin paying back to the nation the substantial sums advanced for the development work.

Saving the Coal

The Fuel Administration is considering limiting the coal supply to plants manufacturing so-called "nonessentials." L. A. Snead of the Fuel Supply Division, has stated that regulations are soon to be announced governing the limitations. The "Great White Way" of the big cities may soon be darkened. An order, it is said, will soon be issued that all unnecessary outdoor lighting must be discontinued during the war. At the same time there will be an appeal for voluntary curtailment of indoor lighting.

An ample supply of fuel, however, has been promised to steel plants working on war orders, some of which, it has been reported, were about to close down for lack of coal. To meet this situation the Fuel Administration will modify the priority order under which large quantities of coal are moving to the Northwest and divert to steel plants "byproduct" coal needed for the production of coke. Other kinds of coal will do as well for the Northwest. If this step does not remove the shortage, plants will be supplied according to the work they are doing for the Government. The appointments have been announced of Wylie B. Bryan, of Louisville, Ky., as state fuel administrator for Kentucky, and of W. G. Bickelhaupt of Aberdeen, S. Dak., to the same position in South Dakota; also for Tennessee, W. E. Meyer of Nashville; Missouri, Wallace Crossley of Jefferson City; West Virginia, J. Walter Barnes of Fairmont; Wyoming, Augustine Kendall of Rock Springs; and for Texas, Wylie Blair of Dallas.

Ferrouranium Process recently patented (U. S. Pat. 1,240,056) by Louis F. Vogt and Robert M. Keeney, assigned to the Standard Chemical Co., uses fluorspar as a flux. Mr. Keeney writes that no other fluxing agent—as, for example, lime—could be used because all the uranium passed into the slag; also, without the use of fluorspar, the output of a furnace seems to be considerably less. The carbon in the production can be controlled down to about 2% by the amount of carbon charged.

Personals

William B. McKinlay has returned to Cuba.

Harry J. Wolf examined manganese and silver properties in Custer County, Colo., recently.

Hon. Martin Burrell has been appointed Canadian Secretary of State and Minister of Mines, in place of Hon. Arthur Meighen.

W. H. Wright has completed examinations of placer properties in Idaho and will return to Denver about the middle of November.

Rodolphe L. Agassiz, president of the Calumet & Hecla Mining Co., has returned to Boston after a business visit to the mine in Michigan.

L. O. Howard, a consulting mining engineer of Salt Lake City, has been appointed dean of the School of Mines of the State College of Washington.

F. P. Bassett has been appointed superintendent of the blast-furnace department of the Cia. Fundidora de Fierro y Acero de Monterey, Monterey, Mexico.

J. R. Woodul, manager of transportation for the American Smelting and Refining Co. in Mexico, is making a tour of the various smelteries in Mexico.

Lawrence Addicks, consulting metallurgical engineer, of New York, has gone to Burma to make a metallurgical investigation of the ores of the Bawdwin mines.

J. B. Tyrrell of Toronto will shortly sail for England in connection with the affairs of the Anglo-French Exploration Co. and the Consolidated Mines Selection Co. of London.

G. A. Shaw has resigned as assistant superintendent of the Michigan mine in northern Michigan to become representative of the Denver Rock Drill and Machinery Co. in the Michigan iron districts.

S. F. Shaw, mining engineer with the American Smelting and Refining Co. at El Paso, Texas, has completed an examination of the Santo Domingo mine, near Monterey, N. L., and has returned to San Antonio, Texas.

David G. Kerr, vice president of the United States Steel Corporation, and **McGilvray Shiras,** ore agent for the same corporation, are making an inspection trip of the company's holdings on the Mesabi range.

O. E. Jager, who recently resigned the position of smeltery superintendent at Cerro de Pasco, Peru, to go to England for war work, has been appointed on the staff of one of the government-controlled lead plants in London.

Frederic G. Moses has been appointed hydrometallurgist at the Salt Lake City station of the United States Bureau of Mines. He has lately been engaged in the installation of pneumatic plants in the graphite fields of Alabama.

Fred H. Williams, president of the Victoria Copper Mining Co. of Boston, Mass., **Sydney S. Millett,** secretary, and **Willard S. Martin** and **A. W. Chesterton,** directors, recently visited the company's property at Victoria, Michigan.

H. DeWitt Smith has resigned as assistant manager at Kennecott, Alaska, for the Kennecott Copper Corporation, to accept the position of superintendent of the mining department of the United Verde Copper Co., at Jerome, Arizona.

R. N. Dickman, of Chicago, is on professional work in North Carolina, after making examinations at Cobalt and Gowganda Lake, Ontario, followed by a month's absence in the Far West. From North Carolina he will go to Butte, Montana.

Maj. Oscar B. Perry, E. O. R. C., formerly general manager of the Yukon Gold Co., is directing the formation of the mining regiment for the first-line service in France. **Capt. W. H. Landers** is in charge of recruiting. **Capt. Norval J. Welsh** is training one company of the regiment at Camp Meade, Maryland.

E. K. Judd, of the mining department of the School of Mines, Columbia University, has been appointed managing editor of the "Bulletin" of the American Institute of Mining Engineers, vice B. A. Robinson, who resigned in June. **Prof. G. A. Roush,** who has been acting temporarily as managing editor since Mr. Robinson resigned, will resume his usual duties in Lehigh University.

M. M. Pearlman, formerly president, treasurer and general manager of Pearlman Co., Inc., and the Clarksburg Zinc Co. of Clarksburg, W. Va., and general manager of the United Zinc Smelting Corporation of New York, has severed his connections with the above-named companies and established himself at 2 Rector St., New York, in the same line of business, under the name of M. M. Pearlman & Co.

Obituary

George T. Holloway, an eminent British metallurgist and head of George T. Holloway & Co., London, died in England on Oct. 24 after a prolonged period of ill health. He was graduated by the Royal School of Mines in 1886 and entered practice as a consulting metallurgist and assayer. He was also a junior demonstrator in chemistry at the School of Mines until 1897. In 1908 and 1909 he was a juror in metallurgy at the Franco-British Exhibition and an inspector at the International Exhibition. He was later appointed by the British government to the Ontario Nickel Commission of which he was chairman. On completion of this work last spring he returned to England, being then in poor health. He was an associate of the Royal College of Science and vice-president of the Institution of Mining and Metallurgy. He was also a Fellow of the Institute of Chemistry and of the Chemical Society and a member of several other scientific and technical societies. He made many friends during his stay in Canada.

Societies

Canadian Mining Institute—The Toronto branch of the Canadian Mining Institute has elected the following executive committee; E. P. Mathewson, chairman, Reginald E. Hore, secretary, W. A. Carlyle, Thomas W. Gibson, H. E. T. Haultain, R. W. Leonard, G. G. S. Lindsey, James McEvoy, Dr. Willet G. Miller, W. E. Segsworth, C. E. Smith and J. B. Tyrrell.

Colorado Metal Miners Association will hold its fifth annual meeting in Denver early in January. Some of the topics of discussion will be: Effects of war conditions on the mining industry; flotation patents and pending legislation; amelioration of the conditions facing gold mining companies due to increased cost of labor and supplies; silver mining and its future; new impetus given prospecting due to great demand and consequent rise in price of various metals. Steps will be taken to establish closer relationship with other similar organizations in Western states.

American Mining Congress will meet at the Hotel Astor, New York, on Nov. 15, 1917, for the purpose of electing five directors to succeed Walter Douglas of Arizona, Carl Scholz of Illinois, S. A. Taylor of Pennsylvania, Charles S. Keith of Missouri, and L. A. Friedman of Nevada, whose terms of office expire; also one director for a term of one year to fill a vacancy. The committee on nominations has selected the same men as candidates, each to serve as director for three years; also John T. Barneson of California to serve for one year.

Colorado School of Mines—The board of trustees, at a meeting held on Oct. 29, elected Dr. Victor C. Alderson president of the school. The board also selected a faculty as follows: C. R. Burger, professor of mathematics; M. F. Coolbaugh, professor of chemistry; W. J. Hazard, professor of electrical engineering; J. L. Morse, professor of mechanical engineering; I. A. Palmer, professor of metallurgy; J. C. Roberts, professor of safety engineering; C. C. Van Nuys, professor of physics; H. J. Wolf, professor of mining; Victor Ziegler, professor of geology and mineralogy; G. E. F. Sherwood, associate professor of mathematics; H. M. Showman, assistant professor of mathematics and civil engineering; C. D. Test, assistant professor of chemistry; F. M. Van Tuyl, assistant professor of geology and mineralogy; J. C. Bailar, special extension work; J. C. Williams, assistant director experimental plant. The members of the faculty have been notified that they have been elected for a period of one year from Sept. 1, 1917. The student-fee fund, amounting to $34,500, has been transferred from the Rubey National Bank of Golden to State Treasurer Higgins.

American Society of Civil Engineers held a meeting, on Nov. 7, in the United Engineering Building, New York. The papers presented for discussion were: "The Subsidence of Muck and Peat Soils in Southern Louisiana and Florida," by Charles W. Okey, and "Pulsations in Pipe Lines, as Shown by Some Recent Tests," by H. C. Vensano. The society has moved its headquarters from 57th St. to the fifteenth floor of the United Engineering Building, where its reading room is now open.

Scientific and Industrial Research Council has, through its recommendations, caused the Canadian government to establish 20 studentships and five fellowships, the latter to be awarded to more advanced students who have completed their preliminary scientific training and show special ability in research. The holders of these scholarships will follow courses of study specially applicable to research as required for the practicable development of Canadian industries. A number of appointments have already been made, those obtaining fellowships being: A. D. Hone, M. A., University of Toronto; A. J. Walker, B. A., University of Saskatchewan, and George H. Henderson, M.A., B.Sc., Dalhousie University. In order to get in touch with Pacific Coast conditions the advisory council has decided to appoint an associate committee of representative men of the chief British Columbia industries to advise with them on matters coming within the scope of their work in that province.

New Patents

United States patent specification listed below may be obtained from "The engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Abrasive Articles, Method of Making. Henry Urtel, La Salle, N. Y., assignor to The Carborundum Co., Niagara Falls, N. Y. (U. S. No. 1,243,783; Oct. 23, 1917.)

Cement—Process for the Manufacture of Cement, etc. Lucien Paul Basset, Paris, France. (U. S. No. 1,244,280; Oct. 23, 1917.)

Chlorination—Process for Separation of Gold and Silver from Minerals. Ricardo Reyes, Mexico, Mexico. (U. S. No. 1,243,976; Oct. 23, 1917.)

Crushing—Liner for Tube Mills. Frank E. Johnson, Salt Lake City, Utah, assignor to American Manganese Steel Co., Augusta, Me. (U. S. No. 1,243,742; Oct. 23, 1917.)

Drill—Hammer Drill. Dane Spehar, Miami, Ariz. (U. S. No. 1,244,386; Oct. 23, 1917.)

Electric Furnace and Method of Operation. William K. Booth, Chicago, Ill., assignor to Booth-Hall Co., Chicago, Ill. (U. S. No. 1,244,415; Oct. 23, 1917.)

Fuel—Apparatus for Feeding Pulverized Fuel. John E. Muhlfeld, Scarsdale, N. Y., assignor to Locomotive Pulverized Fuel Co. (U. S. No. 1,243,753; Oct. 23, 1917.)

Furnace for Smelting Ores. Charles James Beaver and Ernest Alexander Claremont, Cheshire, England. (U. S. No. 1,243,798; Oct. 23, 1917.)

Ingot Mold. Harry Suthann, Middletown, Ohio. (U. S. No. 1,243,779; Oct. 23, 1917.)

Ingot Molds—Process and Apparatus for Coating Molds for Metal Ingots. George Francis Downs, Buffalo, N. Y. (U. S. Nos. 1,243,717 and 1,243,718; Oct. 23, 1917.)

Jig—Universal Jig. John J. Hill, Tonopah, Nev. (U. S. No. 1,244,210; Oct. 23, 1917.)

Lead Pigments, Process of Producing. Alexander S. Ramage, Buffalo, N. Y., assignor to International Color and Chemical Co., Incorporated, Detroit, Mich. (U. S. No. 1,243,762; Oct. 23, 1917.)

Metal Coating — Apparatus for Coating Metal Sheets. James H. Caffrey, Beaver Falls, Penn., assignor to Asbestos Protected Metal Co., Pittsburgh, Penn. (U. S. No. 1,243,808; Oct. 23, 1917.)

Placer Mining—Method of and Apparatus for Placer Mining. Frank E. Hawkesworth, Los Angeles, Calif. (U. S. No. 1,244,203; Oct. 23, 1917.)

Refractories—Composition for Making Fire-Brick and Furnace-Linings. Robert R. Zell, Birmingham, Ala., assignor to Siliconite Refractories Co., Irondale, Ala. (U. S. No. 1,244,275; Oct. 23, 1917.)

Separator—Apparatus for Separating or Concentrating Ores. David Cole, Morenci, Ariz. (U. S. No. 1,243,814; Oct. 23, 1917.)

Sulphides—Method of Reducing Sulphides. Raymond F. Bacon, Pittsburgh, Penn., assignor, by mesne assignments, to Metals Research Co., New York, N. Y. (U. S. No. 1,243,681; Oct. 23, 1917.)

Tungsten—Process for Extracting Trioxide of Tungsten from Its Ores. Ludwig Rosenstein, San Francisco, and Ernest H. Simonds, Oakland, Calif. (U. S. No. 1,244,082; Oct. 23, 1917.)

Editorial Correspondence

SAN FRANCISCO—Nov. 1

Evidence of Discovery of Gold by Marshall is said to be in the hands of Governor Stephens in the form of an admission reported to have been made by Peter Weimmer that Marshall picked up the first piece. So that is apparently settled. Now if the controversy between the Native Sons and Daughters of the Golden West and the remnant of the Argonauts, as to the exact spot may be settled, the historic fact may be written so plain as to preclude the possibility of further contention. Of course, the little boy who is said to have really found the first nugget, which he gave to Marshall, has been eliminated from the controversy and the story that Richard Henry Dana told in his "Two Years Before the Mast" should be obliterated from the minds of men who love to go back in history beyond the days of '48. Anyway, the monument will be put in presentable shape and a new highway lateral built, so that motor car tourists may see the manner of man who "attracted the attention of the civilized globe to California," as a local historian puts it.

Bureau of Mines Rescue Car No. 1 is in California and will remain until Dec. 4. The itinerary included Berkeley from Oct. 17 to 30, where there were lectures and classes for the benefit of professors and students of the University of California, employees of the Industrial Accident Commission, Bureau of Mines employees and their wives. The lectures were by Mr. Steidle on mine gases and Dr. Worley on sanitation and welfare work. The classes were conducted by Mr. Berry and Mr. Pyne. Motion pictures also were a part of the program at the University as they will be at other points to be visited. The further itinerary includes Stanford University at Palo Alto, Oct. 31 to Nov. 6; Martell, the railroad station for the Mother Lode mining districts in Amador County, Nov. 7 to 20; Chinese Camp, Tuolumne County, Nov. 21 to 27; Angels Camp, Calaveras County, Nov. 28 to Dec. 4. The car will return to headquarters at Reno, Nev., Dec. 5 and remain until about Feb. 10, 1918. In case of mine disaster during the stay of the car in California, it can be reached through communication with H. M. Wolfiin, chief mine inspector for the Industrial Accident Commission, and Robert I. Kerr, secretary of the California Metal Producers Association at San Francisco. Edward Steidle, mining engineer, is in charge of the car. Instructors are sent also to mines and mining camps off the railroad, which can not be reached by the car.

Shortage of Oil-Drilling Machinery and materials in California may be relieved by coöperation of the State Council of Defense with the petroleum committee of the National Council of Defense, according to information given to Governor Stephens by Max Thelan, president of the State Railroad Commission. Mr. Thelan states that A. C. Bedford, chairman of the petroleum committee, offers to coöperate with the California defense council in an effort to find a way to assist the oil men who are unable to continue drilling on a scale demanded by the present shortage in oil storage. While the production of the fields is being fairly maintained, the increase in shipments is reducing the stocks to an alarming extent. In the last two years the shrinkage has been nearly 1,000,000 bbl. per month, or to be exact, 26,000,000 bbl. in 28 months. And this shrinkage is in a measure due to the shortage in drilling machinery and materials, as well as the high costs. It is true of course, that the withdrawal of lands by the Government and the several Federal suits that have tied up thousands of acres of oil lands, are responsible for much of the inactivity in drilling; but these causes largely affect the larger producers who are better situated and can obtain drills and drilling machinery more readily than the smaller producers. The drillers are practicing the closest economy, not only in the use of materials but in the selection of ground to be drilled. Mr. Bedford attributes the shortage in drilling materials to the utilizing of Eastern plants for the filling of war-munitions orders. That is plain enough. What California wants to know is the remedy, not the cause. Unless there shall be a remedy provided, and that within reasonable time, the shortage of oil fuel will become a menace. Another three years of the present rate of shrinkage in California will reduce the available supply in this state to zero. There is some compensation in the report of a new gusher development in Montebello field in Los Angeles district. The Standard has brought in a new well which flows 15,000 bbl. a day and is reasonable evidence of what may be expected from other wells. But it would require 10 such gushers to make an appreciable improvement in the storage supply. The shortage is considered serious in California and of such national importance that the Government can not afford to ignore it.

BUTTE—Nov. 3

Phillipsburg Manganese and Silver Ore shipments now average from 350 to 400 tons daily. This amount will gradually be increased to from 800 to 1000 tons a day as fast as some of the older properties can be put in shape for development and exploitation. The camp is experiencing considerable activity, due not only to the great demand for manganese ores, but also to the present high price of silver. In years gone by, the district was a large silver producer.

"Strike Bulletin" published by the strikers, although the strike is a thing of the past, has been coming out now and then with attacks on the mining companies of Butte and the men who are working for them, with the obvious object of curtailing the production of copper. One bulletin stated that the "workers of this country were far behind their brothers in Russia and that the latter had overthrown their old government," a statement taken to mean an effort to arouse a revolutionary spirit in this section. These utterances attracted the attention of the United States grand jury now in session at Butte and a number of witnesses were summoned with the idea of fixing the responsibility. The witnesses were men prominently identified with the metal mine workers' union of Butte and Anaconda. Five men, including Thomas Campbell, Daniel Shovlin and A. Maxwell, were subpœnæd, Oct. 26, and subpœnæs for a dozen more were secured since then, by Foreman Rowe of the grand jury. The result of the jury's investigation has not been announced as yet.

Increase in Cost of Supplies which affects cost of copper production includes materials of every kind. In an official statement from the Anaconda Copper Mining Co., in which employees are urged to economize in the use of materials, but are also advised not to save at the expense of safety or efficiency, attention is called to the constantly increasing cost of all supplies. "Since 1914, the average articles supplied for use around the mines, mills and smelteries have doubled in cost," says the statement. "There are a few notable exceptions, such as lumber, lime and cement, but the price on these has, nevertheless, increased materially. This has been a spendthrift nation. The extravagance begins with our national affairs and extends through most branches of life, including the waste of company supplies. It is not altogether the question of cost of supplies which we waste. It is often a question of replacement at any price. There are assay materials, chemicals, etc., which are imported, some of which today can not be obtained at any figure. These, in some cases, are almost necessary for the operations of certain of the company's departments. The car shortage is daily growing worse and adds its contribution to the trouble." Attention is called to a few of the common supplies used in the mines, and the fact that dynamite costs twice as much as it did in 1914, and that even fuse costs 50% more. Bar steel has more than doubled, while plate steel is three times what it was three years ago. Wire rope, pipe fittings and high-grade oils have doubled in price. A foot of pipe which cost 20c., three years ago, costs more than 40c. now. All small tools have doubled in price, and so have bolts, smeltery brooms, nuts, manila rope and drill steel, while all asbestos material costs three times what it cost before the war.

SALT LAKE CITY—Nov. 2

Embargo at Two Murray Samplers of the Utah Ore Sampling Co., which has been on at these plants for abut six weeks or since Sept. 4, will be lifted on Nov. 5. Owing to the high price of metals, a much larger tonnage than usual was sampled during the last few months. Congestion ensued. The capacity of the two plants together is 1000 to 1200 tons, a day. At times, there have been as many as 170 cars or upwards of 8000 tons of ore, in the yards awaiting sampling. The accumulation of ores has been considerably reduced. The Tintic sampling plant of this company is operating at capacity, and has been able to keep its yards clear.

Reduction in Freight Rates on low-grade copper ore between Gold Hill and Erickson, in the Deep Creek district, and International has been granted by the Public Utilities Commission to the Western Pacific R.R., operating the branch line into that district. The railroad filed a petition with the Public Utilities Commission on Oct. 26, and in granting the privilege, the usual 30 days' notice required by statute was dispensed with. The reductions are as follows: On $6 ores from Gold Hill to International the rate will be $1.25 a ton as compared with a former rate of $1.75; on $8 ores, $1.85 as compared to $2.50; $10 ores, $2 instead of $3 a ton; and on $15 ores, $3 instead of $3.50. The railroad hopes by these reductions, which will allow the moving of such low-grade ores as can be mined at a profit at present prices but which with normal freight rates and prices would not be handled, to encourage greater production of ores as well as the opening of new properties, expecting itself to benefit through the resultant increase in the tonnage transported.

DENVER—Nov. 2

Oil Survey of Colorado is being urged upon the Governor and members of the state council of defense, with the view of determining those regions which are likely to contain oil. This movement is stimulated by the rapid development of the oil industry in the neighboring states. During the last few years, a fund of about $100,000 has been accumulated by the state in fees for the inspection of oils and gasoline, and it is suggested that this fund be made available for use in connection with the proposed oil survey. The idea is regarded favorably by the defense council, and it is likely that the matter will be given serious consideration in the near future. Oil statistics available in Denver indicate that only about 8% of all the oil inspected in Colorado, during the year 1916, was produced within the state. Geologists state that there are many districts in Colorado which are favorable to the occurrence of oil. It appears that the present limited information relative to the state's oil resources is having the effect of greatly retarding the development of the oil industry within its boundaries.

WALLACE, IDAHO—Nov. 2

Bunker Hill Ore Reserves and other interesting conditions in the mine and the problems involved in its economical operation are reviewed by President F. W. Bradley in the company's answer to the American Smelting and Refining Co.'s suit for breach of contract, soon to be heard at Portland, Ore. Mr. Bradley stated: "Defendant's last annual report shows ore reserves blocked out totaling 3,453,146 tons, with bottom level of mine in the best orebody that it has ever enjoyed. As this is eight years' life at present rate of output, with geological conditions in favor of many years of additional life, defendant is fully justified in increasing the efficiency of its plant in order to fortify itself against periods of low prices for lead. This increase of efficiency is economically necessary with the growing depth of the mine, because of the continual expenditure for shafts, sinking machinery, pumping machinery, etc. It would be unwise for us to spend further amounts on the old water-concentrating plants in face of the continual progress being made in the art of metallurgy. In this line of progress the fire concentration now installed in the shape of our smelting plant is a step in advance over water-concentrating practice for our special conditions. So the 'wet process' meth-

od of concentration, already chemically worked out, but not yet commercially developed, promises to be a step in advance over fire concentration. This is because the 'wet process' concentration will not only give us metallic lead, but it will enable us to recover some of the other metals contained in our ores that it is not possible to recover commercially by fire concentration."

Star Mining Co.'s Suit against the Federal Mining and Smelting Co. was called in the United States court for the district of Idaho on Thursday, Nov. 1, Judge Frank S. Deitrich having called a special session in this city for the purpose. The issues involved have heretofore been given in the "Journal." In his opening statement, John P. Gray, of counsel for the Star, outlined the contention of the plaintiff and stated he expected to prove that the defendant company, in the operation of the Morning mine, had trespassed upon the Evening Star and Mary R. fraction claims of the plaintiff and had wrongfully removed therefrom a large amount of ore. Having established this, the matter of damages and value of the ore thus extracted would be taken up later. Judge A. Marshall, of Salt Lake City, who made the opening statement for the Federal, stated that there would be no dispute over the allegation of plaintiff that defendant had entered upon and extracted ore from ground beneath the surface boundaries of the Evening Star claim; this he admitted and stated that in doing so defendant was governed by the law of extra-lateral rights, and that he expected to prove that the vein containing the orebodies in question was identical with the vein that has its apex within the boundary lines of the Grouse and Iron Crown claims, the property of the defendant. The issue was thus made clear and it devolved upon the Federal company to prove its contention, and the taking of testimony in behalf of the defendant proceeded at once. Among the prominent engineers and geologists who are here to testify in the case are the following: For the Federal—Waldemar Lindgren, formerly of the United States Geological Survey; Joseph Barrell, professor of geology, Yale; Milnor Roberts, professor of geology, University of Washington, Seattle; H. A. Buehler, professor of geology, Missouri School of Mines, Rolla; J. R. Finlay, mining engineer, New York. For the Star—Horace V. Winchell, geologist, Minneapolis; C. K. Leith, special geologist, University of Wisconsin, Madison; Albert Burch, mining engineer, San Francisco; Walter Wiley, mining engineer, Los Angeles; Stanly A. Easton, mining engineer, manager of Bunker Hill & Sullivan, Kellogg; Oscar Hershey, mining geologist for Bunker Hill & Sulivan, Kellogg; George Huston, mining geologist, Mullan, Idaho. In addition to these, there are numerous local engineers, practical prospectors, miners and others of wide experience in mining in this district who will be called on both sides. The trial is expected to occupy about two weeks and is expected to develop technical points of much interest.

CALUMET, MICH.—Nov. 3

Men Are Earning $5.50 and $6 per day in many instances in the Michigan copper mines, and as a result the contract system, against which the old Federation of Miners presented so much argument during the strike times of 1913-1914, is proving popular. Even trammers are making high and unheard-of pay for their class of labor. They are also permitted to work on contract and many are getting as high as $4.50 to $5 per day, it is said. The mines of this district now employ approximately 20,000 men. Mechanical equipment for handling labor in a great many kinds of work has replaced man power, but still more men are needed.

Ore Shipments from Marquette district will amount to 2,900,000 tons in round numbers for the year ended Nov. 1, being a decided decrease from the previous year. Approximately 470,000 tons of ore was forwarded from the Marquette and Presque Isle ore docks in October. The Lake Superior & Ishpeming dock forwarded 360,000 tons and the South Shore dock, 101,844 tons in October. To Nov. 1, the Presque Isle dock shipment was 2,233,278 tons and the South Shore dock shipment, 637,382 tons. These figures compare with a shipment to the corresponding date last year of 2,912,702 tons for the Presque Isle dock and 836,254 for the South Shore, a total of 3,748,956 tons. Thus the movement for 1917, to Nov. 1 is nearly 900,000 tons short of what it was at a corresponding date last year. The remaining four or five weeks of the season are not likely to decrease much of this shortage, even if a still further falling off does not occur. What the docks will be able to accomplish during the remaining weeks will depend on weather conditions. So far there has not been much trouble with frozen ore, but from now on it is expected to be an obstacle to the quick dispatch of boats.

VIRGINIA, MINN.—Nov. 3

Bureau of Mines Rescue Car, assigned to the Lake Superior district, arrived at Virginia, St. Louis County, and was at Gilbert and the Lincoln mine until Oct. 27, when it was transferred to the headquarters of the Oliver Iron Mining Co., where it will remain for two weeks. A meeting of Safety men with A. M. Gow, presiding was to be held on Nov. 1, for discussion of various types of rescue apparatus, especially in regard to the helmet type, probably because it was found that during the Cuyuna fires, that the Hibbing apparatus was not in the best working order.

JOPLIN, MO.—Nov. 3

Five-Million-Dollar Deal was reported to have taken place when Texas and Oklahoma men purchased the two mills of the St. Louis Smelting and Refining Co. together with a lease on the company's 160 acres of land about one mile east of Picher, Okla., and in addition, 1240 acres of leases about half a mile further east. It is announced that the new owners expect to start construction of seven new concentrating plants, mill sites already having been selected from drill showings. It is also stated that the new company proposes to build a zinc smeltery and on some of its properties will erect homes of better construction than any put up so far.

Water Power Instead of Steam will be used in the North Arkansas field, if the efforts of the Standard Zinc Co., which is operating at the mouth of Ingram Creek on Buffalo River, are successful. The Standard company has recently ordered a water-power survey to be made. Despite the fact that there is a large area of timber land in the north Arkansas mining field, and it can be obtained cheaply enough as it stands, the inability to get wood choppers has made the cost of wood almost prohibitive. Coal is not even as cheap or obtainable as wood, and lack of available fuel has held back development of the entire field considerably. It is with the hope of relieving this situation that H. Sour, manager of the Standard Zinc Co., recently employed Professor Gladson of the State University at Fayetteville to make a survey of the company's water power, in the hope that the latent power of this kind is sufficient to operate the mill.

The Mining News

ALABAMA

Jefferson County

GULF STATES STEEL (Birmingham)—Concrete lining of slope of Shannon mine completed to 1200-ft. depth. Permanent surface equipment being installed.

ARIZONA

Cochise County

LABOR TROUBLES, such as still exist in Warren district, will be settled by an agreement between operators and men to be effected by President's Mediation Commission, according to Bisbee reports. The terms will be similar to the agreement effected in the Globe-Miami and other Arizona districts.

COMMONWEALTH (Pearce) — Milling machinery sold to United Verde Copper Co. being removed. A. T. Smith recovering silver from old tailings. Crosscut started on 300-ft. level for continuation of orebody found on surface.

Gila County

MIAMI (Miami)—Output for October amounted to 2,673,775 lb. compared with 1,900,000 lb. in September and 4,859,443 in October, 1917.

Mohave County

COPPER AGE (Chloride)—Operated by Arizona Ore Reduction Co. Will replace ball mill with rolls. Steam plant for generating electric energy being installed. E. E. Northrop, superintendent.

GOLDEN HAMMER (Chloride) — Installing hoist, compressor and full equipment. Ore is gold-lead-zinc. Adit 300 ft. long shows oreshoot of good average width. F. C. Smith, manager.

DIANA (Chloride)—Oreshoot 6 ft. wide After lateral extent of shoot known crosscutting will be continued for north vein. opened from 200-ft. level of shaft. Vein cut 13 ft. from shaft is not principal vein.

KEYSTONE (Chloride)—Remodeled mill working silver ores on dump. Water question solved. Believe mining will be resumed soon. F. W. Sherman, superintendent.

Pima County

McANENY PLACER (Tucson)—Trustees of G. B. McAneny estate petitioned court to sell placer to A. J. Taylor, of Denver.

BLACK PRINCE (Tucson) — Leasers opened high-grade, lead-copper ore; preparing to ship. Situated 80 miles southwest of Tucson, in Quijotoa district.

Pinal County

RAY LEAD (Ray) — Shipped 20 cars high-grade lead ore in September.

ARIZONA CORONADO (Price) — Situated two miles south of Reymert mine; is shipping to Wickenburg. Two-compartment shaft being sunk, now 106 ft. deep.

PINAL CONSOLIDATED (Price)—Repairing road from mine to railroad for hauling and large force started at mine. Recently taken over by F. C. Armstrong and associates.

ARIZONA HERCULES (Kelvin)—Heavier parts of two McIntosh & Seymore Diesel engines arrived. Forms for ore bins at mill completed and also power line from plant at mill to mine, six miles distant.

Yavapai County

BIG LEDGE (Mayer)—Crosscut on the 425-ft. level cut 15 ft. of ore. Considered the extension of orebody encountered on 300-ft. level.

JEROME VERDE (Jerome)—According to company report no large orebodies yet developed but pay ore recently followed for 58 ft. above 900-ft. level and 140 tons shipped to smeltery.

ARKANSAS

Boone County

RESIN JACK (Zinc)—Formerly operated by D. G. & B. Mining Co. recently purchased by Ire Doane. In steady operation.

HARRISON MINING AND MILLING CO. (Harrison)—Lease of 300 acres purchased by W. O. Krueger, of Harrison and E. H. Mills, of Springfield, Mo. Opened zinc ore; equipped with 100-ton mill. New company known as Krueger-Mills Mining Co. Will improve mill and install new surface equipment.

Marion County

COWAN BARRENS (Yellville)—Optioned by W. E. Layton, and Zimmerman & Schofield; will test deep ground for zinc ore; contracted for diamond drilling with Moore Bros., of Stone, Ark. Situated between Rush and Hali Mountain camps.

CALIFORNIA

Amador County

PLYMOUTH CONSOLIDATED (Plymouth)—Report for September shows: Ore treated was 10,400 tons estimated to yield, including concentrates, $52,847; working expenses, $30,083; development expenditure, $4996; surplus, $17,768.

ARGONAUT (Jackson)—Cable for hoist which lifts water from 3900-ft. level recently parted about 60 ft. from skip, dropping skip filled with water. 700 ft. Cable had been recently examined, and no weakness found.

Butte County

NATOMAS CO. (Oroville)—Reported result of redredging by Feather No. 1 dredge

warrants continuance during life of dredge. Much gravel excavated is from ground untouched by former operations but some dredged ground said to yield a fair return. In the early days a good deal of low-grade gravel was passed over as being unprofitable.

SURCEASE (Oroville)—Being explored by Goldfield Consolidated Mines Co. Will develop for about six months before deciding upon permanent operation.

Contra Costa County

MOUNTAIN COPPER CO. (Martinez)—Smeltery labor strike ended quickly. Wages raised voluntarily to $3 for common labor, but 16 men demanded more. Upon threat of discharge they returned immediately.

BUTTERS ELECTROLYTIC ZINC SYNDICATE (Richmond)—Operating old Peyton Chemical Co. property. Employing 30 men in construction work and expect to start Jan. 1, 1918. Will make products other than zinc. R. W. French, of Oakland, manager.

PACIFIC POTASH PRODUCTS CO. (Richmond)—Permitted to issue to Henry Michel and eight associates, 600 shares at $100, for formulas for making bichromate of potash, caustic potash and permanganate, and equipment and operation of Richmond Chemical Co. plant to be leased. Shares in escrow.

Eldorado County

FOREST FIRES about Ham's Station on Alpine State highway extending into Amador County, burned 25,000 acres, including lands of Eldorado National forest. Timber damage in canyons large. Now under control. Bottle Hill fire in Georgetown district also under control. About 3000 acres of government and railroad lands damaged.

Inyo County

BUNKER HILL (Bishop)—Being developed by Base Metals Mining Co. composed of Los Angeles and Puente men. High-grade ore, from development, hauled 39 miles by motor trucks to Southern Pacific station at Zurich. Most of ore from old dumps. Situated on eastern slope of White Mountains. Aërial tramway of Salines Valley Salt Co. may be made a common carrier. Harold E. Robinson, superintendent.

Kern County

YELLOW ASTER (Randsburg)—Mill improvements completed.

Nevada County

SNOW POINT (Moore Flat)—Sinking shaft to tap gravel during winter. Expect to reach channel at 350-ft. depth. Whitney Construction Co. operating with 20 men. George Hagerty, manager.

Placer County

BALTIMORE (Forest Hill)—Guy Williams, former foreman, pleaded guilty of "high-grading" a total of $7500; granted probation upon agreement to pay back the amount.

PACIFIC GOLD DREDGES being removed from middle American River, east of Auburn, as dredging is completed, to north fork of American River, north of Auburn where several bars have been prospected.

Plumas County

GOLDEN EAGLE (Quincy)—Cleanup at placer mine at headwaters of Croquette Creek, east of Granite basin, amounted to 58 oz. in addition to $250 in specimen nuggets.

McCARTHY (Quincy)—Chrome mine idle at present, but large deposit said to have been opened. Pack animals will be used to carry ore to top of hill and wagons or trucks will haul to Quincy Junction.

BURCH (Greenville)—Noble Electric Steel Co. completed road from Dixon Canyon to this manganese mine, situated above Indian Falls. Ore will be shipped to the smeltery at Heroult, in Shasta County.

Shasta County

MOUNTAIN COPPER CO. (Keswick)—Labor situation improving; about 90% of normal force employed.

Siskiyou County

CONCRETE DAM across Elk Creek in Happy Camp district to be completed about middle of November by Harry Wilson, W. E. Bishop and Elmer Michaelson. Water to be stored for use in placer mining. Dam will be 70 ft. long and 28 ft. high, with 50-ft. width at base. Water will be 18 ft. deep at wall, and ¼ mile upstream about 10 ft. deep. Automatic gates designed by Harry Wilson will be installed; may be opened separately or all together.

Tuolumne County

STINCHFIELD VS. BUCKEYE (Sonora)—Suit commenced for $20,000 balance due from sale of property to Buckeye Mining Co. by Andrew W. Stinchfield and F. L. Mitchell; $5000 has been paid. Table Mountain Mining Co. included in suit.

MOHAWK (Sonora)—Two-compartment shaft 70 ft. deep; will crosscut at 200 ft. Situated near Gold Hill in Smith Flat district. Frank Raymond, owner.

COLORADO

Boulder County

NIL DESPERANDUM MINES (Box 298, Boulder)—Plant situated near Sunshine. Air compressors and electric power installed since Sept. 1. Sinking winzes about 300 ft. apart on two orebodies to be connected every 75 ft. by drifts. Drifting on lower tunnel and driving crosscuts to hanging wall vein. Acquired Inter-Ocean mine last summer, said to have 200,000 tons reserve of low-grade ore. Intend to erect 100-ton mill using flotation during 1918. Ore is telluride of gold.

Hinsdale County

HIDDEN TREASURE (Lake City)—Being overhauled; shipping lead-silver ore. Situated in Henson Creek section.

GOLDEN FLEECE (Lake City)—Operated under lease by Salt Lake company. Mill remodeled, using flotation.

Lake County

MATCHLESS (Leadville)—Fryer Hill property will be reopened. Retimbering shaft.

HARRISON REDUCTION CO. (Leadville)—Slag dump of Harrison Ave. smeltery will be retreated. Hoist and skip installed.

Ouray County

MOUNTAIN TOP (Ouray)—Tramway to Governor Basin will be built, bridging dangerous slide zone, and permitting winter operation. Mill is entirely underground to avoid snow-slide danger.

CALLIOPE (Ouray)—Development in upper quartzite opened ore; installing electric-driven compressor plant. Power line extension will be made from Western Colorado Power Co.'s line at Bachellor switch. C. W. Larsen, manager.

Park County

FIRE AT ALMA, on Oct. 17, destroyed major portion of business district including post office.

PRODUCTION OF ALMA DISTRICT, due to rise in silver, doubled during last year; new companies have started work.

LONDON (Alma)—Crosscut tunnel will be driven from site below South London, to cut veins at 500 ft. below lowest workings. Steam-driven compressor plant installed. Lessees on upper workings producing shipping-grade ore.

San Juan County

SEPTEMBER SHIPMENTS FROM SILVERTON district, 255 cars ore and concentrates.

IDAHO (Silverton)—Will be reopened by lessees.

COMING WONDER (Silverton)—Lead-silver ore opened recently by lessees.

LACKAWANNA (Silverton)—Will be worked until heavy snow falls. Shipping.

U. S. TREASURY (Silverton)—Lessees opened lead-copper ore in this Ruby Basin property.

ARIADNE (Silverton)—Crosscut being driven to cut vein. Development will be continued all winter.

San Miguel County

WATER SUPPLY OF TELLURIDE district sufficient for winter operation, although summer precipitation small. Smuggler Union draws water from Blue Lake, Tomboy from Lake Ptarmigan and Liberty Bell from springs on Mt. Ballard.

CARBONERO (Ophir)—Shipping ore from development.

MODENA (Telluride)—Final shipment being made for season before closing down.

BLACK BEAR (Telluride)—Compressor and hoist installed. Can produce more ore than Smuggler mill can handle.

Summit County

FIRE AT KOKOMO on Oct. 11, destroyed main hotel and six other buildings.

SQUARE DEAL (Frisco)—Repairing tunnel cave-in.

KING SOLOMON (Frisco)—Shipping from stope, on 200-ft. level. Developed considerable ore.

TONOPAH PLACERS (Breckenridge)—Camp No. 2, near dredge No. 2, completed. Modern houses built for 30 men.

MONTE CRISTO (Breckenridge)—Mill alterations nearing completion, and plant will be in operation soon. Considerable tonnage of broken ore available.

Teller County

JERRY JOHNSON (Cripple Creek)—Caley lease making regular shipments.

VINDICATOR (Cripple Creek)—Semi-monthly pay day adopted.

PORTLAND (Cripple Creek)—More high-grade ore in winze from No. 2 shaft at 2000-ft.

ELKTON (Cripple Creek)—Lessees working through main shaft. Three cars ore per week in addition to dump ore.

AJAX (Cripple Creek)—Water level at 1973 ft. in shaft. Station will be cut and level driven at 1980 ft. Elevation of 8135 ft.

RAVEN & BEACON HILL CO. (Cripple Creek)—Lateral from Roosevelt tunnel completed, and development on vein under way. Owns 17 acres on Raven and Beacon hills.

IDAHO

Shoshone County

NATIONAL COPPER (Mullan)—Mill running at half capacity on Oct. 13; since shipped three carloads concentrates averaging about 20% copper, 55 oz. silver and small amount gold. Expect to be running at full capacity of 500 tons per day shortly.

HECLA (Burke)—Management states that litigation between American Smelting and Refining Co. and Bunker Hill & Sullivan Co. would not interfere with contract with Bunker Hill smeltery. Building bin, with capacity equal to daily mine output, sorting plant, and change room for 500 men. Extending levels and increasing production; four years supply of ore, at present 1000-ton daily output.

MICHIGAN

Copper

HANCOCK (Hancock)—Has 372 men and need 125 more. Daily tonnage same as in October, 1100 tons.

SOUTH LAKE (Lake Mine)—Increasing daily tonnage from 150 in August to 222, making about 6000 tons for October.

MICHIGAN (Rockland)—Chicago, Milwaukee & St. Paul will lay track on spur extension soon; then rock will be shipped to mill.

BEAR LAKE "POOL" (Hancock)—Good core from second diamond-drill hole at 150 ft.; third down 23 ft. in overburden. Vice-President Murray acting as managing director.

CHEROKEE (Houghton)—Is in the usual small mass and heavy-stamp copper for 25 ft. in eastern drift with lean and broken ground west. Sinking from 420-ft. level awaiting new rope.

CALUMET & HECLA (Calumet)—According to report contracted with Minerals Separation company, to pay royalty of 1c. per lb. on copper recovered by flotation process. White Pine Copper Co., a subsidiary will use flotation extensively. Present daily tonnage, including 910 tons of Tamarack, 10,190, comparing with 9200 few weeks ago. Expect Goodman storage-battery locomotives at Osceola, making total of 12.

Iron

PIONEER IRON (Marquette)—Receiving bids on erection of steam-heated ore-drying shed at North Marquette plant for thawing frozen ore in cars to facilitate handling. Dimensions will be 200 x 40 ft., with capacity of 24 cars.

MINNESOTA

Mesabi Range

OLIVER (Virginia)—One man killed in milling pit at Alpena mine by falling rock; another killed and three injured at Deacon mine by cave-in.

MISSABE MOUNTAIN (Virginia)—Construction on 300-ton Marion shovel known as 225B proceeding slowly. Other Marion shovel at Hibbing further advanced.

MISSOURI

Joplin District

COOK & MITCHELL (Oklahoma City, Okla.)—Leased four 40-acre tracts east of Picher, Okla.

D. E. McDOWELL (Joplin)—Drilling tract south of Lincolnville, Okla. Region heretofore unexplored.

BOOTH & CO. (Joplin)—Seven holes on tract at Waco Mo. show ore. Will continue drilling.

NEFF & HARRINGTON (Joplin)—Started first shaft near Crestline, Kan., west of Badger, where drilling showed good ore.

DULUTH (Quapaw, Okla.)—Building 500-ton mill on lease near Quapaw. Duluth, Minn., men interested. Also have lease north of Kansas line.

JACK RABBIT (Miami, Okla.)—Putting down two shafts on lease near Lincolnville. One in ore at 95 ft. Will build mill. G. N. McBrian, Miami, one of principal owners.

BUFFALO (Miami, Okla.)—No. 1 mill, north of Quapaw, completed; rich ore at 180 ft. Will construct second mill, on lease west of Blue Mound, Kan., after Jan. 1; will build third mill later. F. R. Bouldin, Miami, president.

MONTANA

Lewis and Clark County

ROCK ROSE (Helena)—Shipping ore from stopes.

BLUE BIRD (Helena)—New gasoline hoist being installed. Copper-silver ore.

HELENA MINE (Helena)—Shipped 20 carloads; orebody indicated at 300-ft. level.

PORPHYRY DIKE (Rimini)—New 300-ton ball mill ready for operation, replacing 20-stamp quartz mill. Electric power.

ST. LOUIS MINING CO. (Marysville)—Output 80 tons a month with 25 stamps from old stopes in Drumlummon mine.

BALD BUTTE (Marysville)—Crosscut advanced 500 ft. on 400-ft. level from shaft to new lead; will drive 200 ft. further. Air compressor and electric power.

Mineral County

TARBOX (Saltese)—At office in Wallace, Idaho, announced shaft down 800 ft. and crosscutting 8 to 10 ft. per day. Should reach vein in 350 ft. Opened ore of milling grade on 400- and 600-ft. levels.

Silver Bow County

BUTTE & SUPERIOR (Butte)—Output of zinc for October reported to be about 12,000,000 lb.

EAST BUTTE (Butte)—October production amounted to 1,700,000 lb. which is about normal.

NORTH BUTTE (Butte)—Lining of Granite Mountain shaft, destroyed by fire last June, completed; mining will be resumed shortly. Speculator shaft hoisted 100 tons per day during October besides carrying supplies.

TUOLUMNE (Butte) — Developing Colusa-Leonard Extension in eastern section. Shaft sunk from 800-ft. level, 10 ft. a day and will be carried to 1600-ft. level where exploration will be done by crosscuts north and south to property lines.

ANACONDA (Butte) — Production in October amounted to 22,336,460 lb. an increase of 19,500,000 lb. over the previous month and largest since May. Production of zinc was 3,878,675 lb. Mines reported to be operating at 80% normal output.

NEVADA

Clark County

IRONSIDES MINING CO. (Goodsprings)—Developing good ore and tonnage blocked out. W. H. Gable, president; A. J. Shumway, secretary. Main Office; Scottsbluff, Neb.

BOSS GOLD MINING (Goodsprings)—Working on fourth level; shipping copper ore. H. K. Riddall, manager. One shipment of platinum ore made to Los Angeles, Calif. Pacific Platinum Works just completed leaching plant for treating this ore. Latter's office, 229 East Ninth St., Los Angeles, Calif.

Nye County

CHARLES KEELHOFER and Claude Marrin sinking shaft with force of men in Gold Reef district. Down 75 ft.; formation changed within last 20 ft., showing quartz; ore shows good gold content. Situated 10 miles from Tonopah, and one mile east of Tonopah & Goldfield road.

TONOPAH ORE PRODUCTION for week ended Oct. 27, amounted to 10,578 tons valued at $185,115, comparing with 9341 tons, the previous week. Principal producers were: Tonopah Belmont, 2491 tons; Tonopah Mining, 2850 tons; Tonopah Extension, 2380 tons; Jim Butler, 1050 tons; West End, 1118 tons; MacNamara, 406 tons; Montana, 53 tons; Rescue 128 tons; Cash Boy, 55 tons.

UNION AMALGAMATED MINING (Manhattan)—From 600-ft. level, face of north crosscut in quartzite for last 10 ft.; expect to encounter orebody within 15 ft. No. 11 north crosscut in low-grade ore extended through Earl shoot and proved ore for 30 ft. South crosscut continuation should cut hanging wall in about 20 ft.

NEW MEXICO

JUMBO MINING CO. (Deming)—Present equipment is 80-hp. boiler, 300-cu.ft. oil-burning compressor, three Jackhamer drills, 8 x 10-in. geared steam hoist, No. 7 sinker, 8 x 5 x 10-in. Snow station pump for 250-ft. level. On 200-ft. level, driving to strike No. 2 silver-lead, also No. 3 vein about 125 ft. westward. Situated nine miles from Florida station; using one-ton and two-ton trucks for hauling. Charles W. Lininger, in charge.

OKLAHOMA

LABOR TROUBLES in Tulsa, Okla. oil fields, according to reports, resulted in dynamiting of home of J. Edgar Pew, general manager of Carter Oil Co. Guards have been increased around properties. Many I. W. W. members have departed from district because of police activity.

OREGON

Josephine County

GOLD KING (Kerby)—Work suspended on this gold mine. T. P. Johnson, manager.

JACK AND TOM (Kerby)—Carload chrome shipped. Working small crew on five claims. J. M. Finch, manager.

QUARTZ LOAN (Grand Pass)—G. W. Finch developing quartz gold mine in Medford district.

GRIMMETT CHROME (Kerby)—Several cars of chrome shipped. Work suspended on account of poor grade of ore. Grover Grimmett, manager.

Jackson County

FRUIT RANCH MANGANESE (Gold Hill)—This manganese property on old Fruit Ranch, 20 miles northeast of here, leased to Herbert Brewitt, of Tacoma, Wash. C. F. Daugherty recently made examination for Noble Electric Steel Co., of San Francisco. Lessees ordered equipment for concentration plant and lumber for building. Consists of 280 acres.

SOUTH DAKOTA

LITHIA MINES at Keystone continue regular production. O. M. Lane shipping spodumene and Rheinboldt Metallurgical Co. mining amblygonite. Shipping two cars weekly.

ELKHORN TUNGSTEN (Hill City)—Developing. Will sink shaft 100 ft. further. Plant to be remodeled and handle custom ore. Amil Anderson formerly with Homestake, in charge.

UTAH

Juab County

TINTIC SHIPMENTS during October amounted to 674 cars as compared to 634 in September. There were 34 shippers. Properties showing increases during October over September were: Colorado Consolidated, which shipped 63 cars—about twice the normal output; Iron Blossom, which showed 21 cars more than in September. Eagle & Blue Bell, owing to embargoes in September, shipped only 5 cars. For week ended Oct. 19 shipped 203 cars, an increase of 35 over previous week.

EUREKA METALLURGICAL (Eureka)—Organized by local men; reported that custom mill will be built. Have been operating successfully small experimental mill. M. McChrystal, president.

IRON BLOSSOM (Silver City)—Rumors that dividends will be discontinued denied by officials. Reported $160,000 in treasury when dividend of $50,000 was paid. Ore supply reduced in recent years, but stated to be sufficient for some time.

Salt Lake County

BOSTON DEVELOPMENT (Salt Lake)—Streaks of shipping ore reported in tunnel of Maxfield mine.

MONTANA - BINGHAM (Bingham) — Tunnel completed, and crosscutting for Mayflower and Fortuna veins, outcropping 2000 ft. above tunnel, on dip.

BINGHAM AMALGAMATED (Bingham)—Showings on 300-ft. level of 600-ft. shaft are widening in raise. May be extension of fissure productive in adjoining Congor. Two cars shipped week ended Oct. 13.

UTAH APEX (Bingham)—Net profits for June, July and August, $195,506. Receipts for last month of quarter, $215,932; disbursements, $110,013. Averaging 550 tons daily of shipping and mill ore; reserves increased.

SELLS (Alta)—To build 2000-ft. tramway from Lexington tunnel of Sells to portal of drainage tunnel of Wasatch mines. Minimum capacity, 10 tons per hour. Production about two cars weekly, and with new line will ship all winter.

OHIO COPPER (Bingham)—Annual production estimated at over 5,000,000 lb. New 3000-ton flotation plant to increase production to 15,000,000 lb. annually. Present mill treating about 2300 tons daily, which is hauled through company's Mascotte tunnel.

Piute County

FLORENCE MINING (Marysvale)—New mill working three eight-hour shifts, shipping up to six cars of calcined alunite weekly.

Utah County

PACIFIC (American Fork)—New mill of Fissures Exploration started operating. Treating 200 tons in three shifts.

Summit County

PARK CITY SHIPMENTS during October were 11,536 tons as compared to 10,365 tons in September. Value of October output estimated at $440,000. Production for first 10 months of year approximately 83,000 tons. District has been affected by smelter embargoes, car shortages, and congestion at samplers. October output higher than normal, which has been between 7000 and 8000 tons.

Tooele County

WESTERN UTAH COPPER (Gold Hill)—September production was 21,000 oz. silver and 326,000 lb. copper. May pay dividends soon. Building clubhouse for employees.

POLE STAR (Gold Hill)—Developing high-grade copper in inclined shaft and raise above No. 2 tunnel.

BIG CHIEF, in Ferber section of Deep Creek district, has about 500 tons on dump; hauling interrupted.

WESTERN UTAH EXTENSION (Gold Hill)—Installing hoist at Mogul shaft; rebuilding compressor plant. Developing.

WOODMAN MINING (Gold Hill)—High-grade streaks in main tunnel on Frankie claims reported to have widened to several feet and will ship first car in few days. Employing 15 men. Shipping from other properties.

CANADA

British Columbia

CONSOLIDATED MINING AND SMELTING CO.—Completed purchase of gold-quartz properties in Camp McKinney and Fairview districts, 20 miles apart. About 2000 acres in each camp; Camp McKinney includes Cariboo mines. Siliceous fluxing ores also present. West Kootenay Power and Light Co. subsidiary of the Consolidated is constructing line from Cascade Station to Princeton, B. C., to supply power to these camps.

Ontario

MINAKER (Kirkland Lake)—Gold veins 4 ft. wide discovered.

NATIONAL (Cobalt) — Flotation mill, formerly King Edward, in full operation and satisfactory.

ELLIOTT-KIRKLAND (Kirkland Lake) Drifting on good orebody, 12 ft. wide, cut on 325-ft. level. Main shaft will be sunk to 500-ft. level.

REEVES-DOBIE (Gowganda) — Being dewatered preparatory to development under direction of Mr. Crowe of Porcupine Crown.

SCHUMACHER (Schumacher) — Mill treating 180 tons per day; mill heads reported averaging $7 per ton and costs about $4.

TEMISKAMING & HUDSON BAY (Cobalt)—Eighth annual report for the year ended Aug. 31 show total income of $190,902. Ore reserves estimated at 107,614 oz.

DOME (South Porcupine)—Semi-annual statement shows gross income of $701,810; operating and developing costs, $534,575; net earnings, $167,234. Total surplus was $864,285, against depreciation of $141,164; war tax on profits, $27,415 and dividends, $100,000, leaving net surplus of $595,706, a decrease of about $100,000.

HOLLINGER CONSOLIDATED (Timmins)—Mill equipment to increase present capacity of 1800 tons to 2800 completed. Expenditure, including installation of extra power and equipment of new central shaft, estimated at about $1,000,000. In trial runs only some units will be operated at one time, and, as each is found satisfactory, a similar old unit can be struck down. Owing to labor shortage complete mill will not be operated to capacity for some time.

MEXICO

SILVER BULLION, amounting to $10,000, stolen by force of Villistas from northbound train on Mexican Central Ry. at Armendariz station, 50 miles south of Chihuahua on Oct. 4, according to reports from Juarez; the train was dynamited, and dispatches state that 125 passengers, including 60 federal guards and two women, were shot. Reports from El Paso state General Felix Diaz with 600 soldiers has captured Puebla.

PANUCO (Monclova, Coahuila)—Being operated by American Smelting and Refining Co. Railroad to mine, 67 km., long repaired and ore shipments being made. S. F. Shaw, superintendent.

BOLIVIA

RAILWAY from Potosi to Sucre is being rapidly constructed. Preliminary surveys for automobile roads are being made by engineers sent to Tarija by the government. The Cia. Consolidada in Colquechaca is completing installation of steam-power plant recently purchased from Guernica Mining Co. in Uyuni. The Austro-Bolivia, Ltd., is expecting arrival of dredging equipment shortly at Potosi. Antimony veins reported discovered near Sucre are deposits of 68 to 69% sulphide without quartz. Veins are not large.

The Market Report

SILVER AND STERLING EXCHANGE

Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
1	4.7515	89⅛	45⅛	5	4.7515	87¼	44⅛
2	4.7515	88⅛	45⅛	6	4.7515	...	44⅛
3	4.7515	88⅛	44⅞	7	4.7515	86¼	44

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Nov.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
1	*23½	66	5½ @6	5.42½ @6.00	7.35 @7.40
2	*23½	66½	5½ @6	5.42½ @6.00	7⅜ @7½
3	*23½	66½	5½ @6	5.42½ @6.00	7⅜ @7½
5	*23½	68	6 @6½	6 @6½	7⅜ @7½
6	....	...	...	...	....
7	*23½	70	6½ @6¾	6.17½ 6.25	7½

*Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market)are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c. St. Louis-Pittsburgh, 13.1 cents.

LONDON

Nov.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
1	110	110	125	257¾	257¾	30½	54
2	110	110	125	258	258	30½	54
3	....	....	....	....	....	....	....
5	110	110	125	260	260	30½	54
6	110	110	125	260	260	30½	54
7	110	110	125	266	266¾	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.75½. £30½ = 6.474c.; £54 = 11.462c.; £120 = 25.473c.; £137 = 29.082c.; £240 = 50.946c. Variations, £1 = 0.212277c.

Metal Markets

NEW YORK—Nov. 7

The metal markets became decidedly more interesting this week, especially lead. Tin rose to the highest figure recorded since the beginning of the war. Zinc was dull, but a shade firmer. The copper market being now an arbitrary matter, nothing need be said of it.

Copper—There were no features of interest or importance that need to be reported.

Copper Sheets are quoted at 34c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire quoted at 30c. per lb., f.o.b. mill.

Tin—This market rose sharply on very small business. The demand was sharp, and the only reason that the volume of business was small was the scarcity of the supply. Straits and Banka tins are almost unobtainable. On Wednesday afternoon Straits tin was sold at 70c. It will not be surprising later if it develops that sales were made at even higher figures. Banka tin was quoted at 68c., Chinese at 66c. or upward, but these quotations were largely nominal owing to the inability of anybody to get anything but stray lots.

The tin market has received a shock through the recent news that Great Britain will no longer grant permits for exportation until the name of the consumer who is going to use the tin is communicated, and inasmuch as it will grant permits only for 25-ton lots, traders are put out of business, while moreover the dealer who buys tin for distribution to consumers in lots of one to five tons is no longer able to do business.

Exports of tin from Bolivia for the four months ended April 30 were 9631 gross tons of barrilla or concentrates, equivalent to 5779 tons fine tin. For the six months ended June 30 the exports, reduced to terms of fine tin, were 8638 tons to Great Britain and 2238 to the United States; a total of 10,876 tons, showing an increase of 1179 tons over last year.

Lead—Following the enormous sales of last week there was some relaxation, but the business of this week was also large, having amounted probably to as much as 10,000 tons. There was one large sale to Canada, and there were many domestic sales in lots of 100 to 250 tons, but a multiplicity of small orders—50-ton lots and such—accounted for a large part of the total. An encouraging feature was that consumers figured so largely as buyers, there being demand from all kinds of consumers except corroders, who were rather conspicuous by their absence. However, corroders take care of themselves largely by average price contracts. The A. S. & R. Co. was a seller right through the week at its quoted prices, but it adhered to its terms of selling only for shipment within 30 days and turned away customers desiring to buy for December and January delivery, who then went to other people and paid for what they wanted at as much as a half a cent over the price of the A. S. & R. Co. Beginning with Monday the A. S. & R. Co. was no longer willing to sell at less than 6c., and on Monday afternoon it was announced that it had advanced its price to that figure. The demand continuing unabated, a further advance to 6¾c. was made on Wednesday morning. Outsiders accepted a little business during the day at that price, but generally they asked more, and the market closed strong.

As a result of representation made to the Canadian government by Premier Brewster of British Columbia as to the serious effect on the silver-lead mining industry of the Slocan district of the embargo recently placed on silver-lead ore by the Trail smeltery of the Consolidated Mining and Smelting Co., remedial measures have been adopted. S. G. Blaylock assistant general manager of the Consolidated states that the company's reason for refusing to accept ores carrying over 4% zinc is that the company has a great stock of lead ore accumulated and that the market for lead in Canada has decreased. The government, in order to relieve the situation, has undertaken to remove the embargo on exportation of lead and zinc to the United States, and the Imperial Munitions Board has placed an order with the Consolidated Mining and Smelting Co. for 6000 tons of lead for munition manufacture.

Zinc—This market was dull, but was a little stronger, statistics published during the week by the Government being regarded as favorable rather than the reverse. The sales of the week included some for export. At the close there were still sellers at 7¾c., but they were not so eager as they had been, and there were indications that the price would move upward if any considerable demand should develop.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Aluminum—This market continues dull with quotations nominal at 37@38c. per lb. for No. 1 ingots at New York.

Antimony—Unchanged at 14@14¼c. for spot, while futures are quoted at 13½c. c.i.f. in bond. Business was very light. The Chinese and Japanese producers were still out of the market.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.40 @1.60 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Steady at $100. San Francisco reports, by telegraph, $100, firm.

Gold, Silver and Platinum

Gold—The embargo placed on gold exports some time ago appears to have reduced the outflow of gold. In the four weeks ended Oct. 21 the total was $18,500,000, or only about one-half of that for the previous four weeks; the shipments in both periods were mainly to Spain and Japan. The Federal Reserve Board at Washington has agreed to license a special export of $25,000,000 to Canada, where the banks at this time need reserves for currency furnished to move the crops. Most of this export will probably be returned later.

Silver—This metal has declined steadily throughout the week conforming to the weakness in London, where the market closed at 44d., and at 86⅝c. in New York.

Mexican dollars at New York: Nov. 1, 69c.; 2, 68½c.; 3, 68c.; 5, 67c.; 6, . . . 7, 66c.

Platinum—Steady at $103 to $105, demand fair.

Palladium—Advanced to $125@130 on brisk demand.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 3—Blende per ton, high, $73.40; basis 60% Zn, premium, $75@72.50; medium to low, $65@55; calamine, per ton, basis 40% Zn, $35; average selling price, all grades of zinc, $57.37 per ton.

Lead, high, $68.70; basis 80% Pb, $65; average selling price, all grades of lead, $64.95 per ton. Lead basis price was advanced $5 per ton.

Shipment the week: Blende 7440, calamine 744 tons, lead 935 tons. Value, all ores the week, $530,320.

Word was circulated in Joplin today that the smelting works of the Fort Smith Spelter Co., Ft. Smith, Ark., had been closed; lack of margin on the profit side is said to be the cause.

Platteville, Wis., Nov. 3—Blende, basis 60% Zn, $62.50 base for premium grade down to $57 base for medium grade. Lead ore, basis 80% Pb, $60 per ton quoted but no sales are reported on this base. Shipments reported for the week were: 2211 tons of zinc ore, 89 tons of lead ore, and 598 tons of sulphur ore. For the year to date the figures are: 122,479 tons of zinc ore, 6365 tons of lead ore, and 24,197 tons of sulphur ore. Shipped during week to separating plants, 3502 tons of zinc ore.

Other Ores

Manganese Ore — November schedules have advanced the price to $1.20 per unit for high-grade metallurgical ore, averaging 48% or better.

Molybdenum Ore — Unchanged at $2.20 per lb. on the basis of 90% molybdenum sulphide.

Pyrites—Spanish lump quoted at 15c. per unit, on basis of 10s. ocean freight, buyer to pay war risk, less 2%; this concession on the war risk was made on a recent contract for 10,000 tons of Spanish lump. Ocean rates remain at 35s. for Northern, 40s. for Southern and 42s. 6d. for Gulf ports.

Tungsten Ore — Prices have stiffened. High-grade wolframite was sold at $25 per unit but $26 is now being asked. Scheelite was handled at $26 for spot ore but sellers want $27.50 for future deliveries. Low-grade ores were not in much demand, a lot carrying 63 to 65% WO_3, 2% Sn and

0.1% Cu, being offered at $21 without sale. Considerable business was done in high-grade ore for forward deliveries, several contracts being reported for requirements up to June, 1918, and farther.

Iron Trade Review

PITTSBURGH—Nov. 6

Last night the Washington authorities announced a third batch of steel prices: Blue annealed sheets, 10 gage, 4.25c.; black sheets, 28 gage, 5.00c.; galvanized sheets, 28 gage, 6.25c.; tin plate, $7.75; merchant steel pipe, a 51% list, equal to 52, 5 and 2½%; plain wire, 3.25c.; cold rolled shafting, 17% off list. These prices are approximately what was expected, and practically complete the price fixing operation as relates to the iron and steel producing industry. Details are to be arranged by the manufacturers, who have shown a strong spirit of coöperation with the Government. The American Iron and Steel Institute, which has charge of much of the detail work, has announced a full set of pig iron differentials and analyses.

Set prices previously announced were: Iron, ore, same as 1917 season; pig iron, $33; billets, 4 x 4 and larger, $47.50; small billets, $51; slabs, $50; sheet bars, $51; wire rods, $57; bars, 2.90c.; shales, 3.00c.; plates, 3.25c.; grooved skelp, 2.90c.; universal skelp, 3.15c.; sheared skelp, 3.25c.

The set prices average slightly more than double the 10-year average ended 1913. They are low compared with the market of a few months ago, but they do not look so low as they would have at that time, for the passing of time has emphasized the fact that owing to the war the consumption of steel is decreasing, particularly in the non-essential industries, and steel may be distinctly plentiful a few months hence. The Government will use all the steel it can find means to employ, but the total of steel for the Government and its Allies can hardly amount to more than 40%, figured on the present rate of production.

The prices announced this week bear various relations to previous market prices. The black sheet price of 5c. compares with 8@9c. ruling last June and July, but the market has been declining rapidly in the last few weeks and yesterday, before the Government prices were announced, there were sheets available in the open market at 5c. The 51% list for pipe compares with the 55% list the National Tube Co. has adhered to since last March, but with lists of 49% and 42% held by various independents. The 3.25c. basis for wire coincides with the advanced price made a fortnight ago by the American Steel and Wire Co., an advance from 3.15c., while the independents had been holding to 3.95c.

Pig Iron—A full schedule of differentials and analyses to govern transactions in the pig-iron markets, based on the $33 agreement announced Sept. 24, has just been promulgated by the American Iron and Steel Institute, at the request of the War Industries Board. The $33 price covers No. 2 foundry and basic iron, at furnace, in all districts. Malleable is set at $33.50 and the $36.30 tentative price on bessemer, set by the trade immediately after the original price fixing, is confirmed. Iron containing 1.75 to 2.25% silicon is classed as foundry iron. A sale of 10,000 tons of basic is reported, at $33, a sale of 150 tons of off basic, at $32.50, the producer paying a commission of 1% to the broker making the sale, and a sale of 1500 tons of special bessemer, at $38.30, $1 being added for the phosphorous being 0.09% instead of 0.10% and $1 for the sulphur being 0.025% instead of 0.05%. Messrs. W. P. Snyder & Co.'s computations show average prices obtaining in October sales of $36.30 for bessemer and $33 for basic, precisely the set prices. The tonnage included was fully 100,000 tons, the largest amount since June.

Ferroalloys

Ferromanganese—The market continues quotable at about $275 for prompt and $250 for first half, with very little demand, consumers evidently counting upon the Government taking care of them and being indisposed to maintain large stocks.

Coke

Connellsville—Conditions are unsatisfactory, production and shipments being lighter while some operators seem indisposed to sell what coke they can ship. Consumers are complaining at Washington. The report comes again that the Fuel Administration will reduce the set price of $6. In some quarters it is thought the Government may be forced to make an example of one or two coke operators in order to bring out more coke at the set price.

STOCK QUOTATIONS

N. Y. EXCH.†	Nov. 5
Alaska Gold M.	3½
Alaska Juneau	3
Am.Sm.& Ref.,com.	71½
Am. Sm. & Ref., pf.	102¾
Am. Sm. Sec., pf., A	94
Am. Sm. Sec., pf. B	96
Am. Zinc	12½
Am. Zinc, pf.	43
Anaconda	54
Batopilas Min.	1
Bethlehem Steel	‡79½
Bethlehem Steel, pf.	90
Butte & Superior	16½
Cerro de Pasco	30½
Chile Cop.	12½
Chino	38½
Colo.Fuel & Iron	31½
Crucible Steel	51½
Dome Mines	7¼
Federal M. & S.	11
Federal M. & S., pf.	31
Great Nor., ore ctf.	23½
Greene Cananea	35½
Gulf States Steel	81
Homestake	96
Inspiration Con.	39
International Nickel	26
Kennecott	28½
Lackawanna Steel	‡77½
Miami Copper	26
Nat'l Lead, com.	38½
National Lead, pf.	‡101
Nev. Consol.	16½
Ontario Min.	4½
Quicksilver	1½
Quicksilver, pf.	1½
Ray Con	20
Republic I.&S.,com.	70½
Republic I. & S., pf.	‡98½
Sloss-Sheffield	34½
Tennessee C. & C.	12
U. S. Steel, com	92½
U. S. Steel, pf.	109½
Utah Copper	73½
Va. Iron C. & C.	50

N. Y. CURB†	Nov. 5
Big Ledge	1⅛
Butte & N. Y.	.75
Butte C. & Z.	6⅛
Butte Detroit	⅛
Caledonia	.52
Calumet & Jerome	1 3/16
Can. Cop. Corpn.	1 1/16
Carlisle	4⅛
Cashboy	.04
Con. Ariz. Sm.	1 3/16
Con. Coppermines	7⅛
Con. Nev.-Utah	3/16
Emma Con	⅛
First Nat. Cop.	2⅛
Goldfield Con.	.40
Goldfield Merger	.04½
Greenmonster	3/16
Hecla Min.	3⅛
Howe Sound	4
Jerome Verde	.93¾
Kerr Lake	5
Louisiana	⅛
Magma	35
Majestic	‡.35
McKinley-Dar-Sa.	.62
Milford	1
Mohican	‡.25
Mother Lode	.28½
N. Y. & Hond.	11
Nipissing Mines	7¼
Ohio Cop.	.75
Ray Hercules	3
Richmond	‡.56
Rochester Mines	.39
St. Joseph Lead	‡15½
Standard S. L.	‡ 1/16
Stewart	.25
Success	.12
Tonopah	4 3/16
Tonopah Ex.	1⅛
Tribullion	⅛
Troy Arizona	.15
United Cop.	.50
United Verde Ext.	‡33½
United Zinc	1⅛
Utica Mines	.13
Yukon Gold	1⅛

SAN FRAN.*	Nov. 6
Alta	.02
Andes	.13
Best & Belcher	.03
Bullion	‡.01
Caledonia	.06
Challenge Con.	.05
Confidence	.06
Con. Virginia	.12
Gould & Curry	.02
Hale & Norcross	.03
Jacket-Cr. Pt.	.04
Mexican	.23
Occidental	.60
Ophir	.19
Overman	.04
Savage	.04
Seg Belcher	‡.02
Sierra Nevada	.16
Union Con.	1.20
Utah Con.	.01
Belmont	‡3.75
Jim Butler	.70
MacNamara	.21
Midway	.10
Mont.-Tonopah	.10
North Star	.06
Rescue Eula	.11
West End Con.	.67
Atlanta	.09
Booth	.03
Comb. Frac.	‡.03
D'field Daisy	‡.02
Florence	.10
Jumbo Extension	.15
Kewanas	.07
Nevada Hills	.05
Nevada Packard	.25
Round Mountain	.22
Silver Pick	.10
White Caps	.07
Big Jim	‡.50
United Eastern	3.50

BOSTON EXCH.*	Nov. 5
Adventure	1
Ahmeek	.83
Algomah	.25
Alloues	.50½
Ariz. Com., ctfs.	8½
Arnold	.25
Bonanza	.21
Butte-Balaklava	.25
Calumet & Ariz.	62
Calumet & Hecla	430
Centennial	13
Copper Range	43
Daly West	1½
Davis-Daly	3½
East Butte	9
Franklin	4½
Granby	63
Hancock	9
Hedley	‡16½
Helvetia	.25
Indiana	1¼
Isle Royale	21
Keweenaw	1½
Lake	5½
La Salle	2½
Mason Valley	3½
Mass	5½
Mayflower	1½
Michigan	1½
Mohawk	60
New Arcadian	2
New Idria	10½
North Butte	12½
North Lake	.60
Ojibway	1½
Old Dominion	33
Osceola	57
Quincy	61
St. Mary's M. L.	53
Santa Fe	.75
Seneca	6
Shannon	5½
Shattuck-Ariz.	18½
So. Lake	1½
So. Utah	.10
Superior	4½
Superior & Bost.	2½
Trinity	3½
Tuolumne	1½
U. S. Smelting	43
U. S. Smelt'g, pf.	45½
Utah Apex	2½
Utah Con.	10½
Utah Metal	3
Victoria	2
Winona	‡2
Wolverine	32½
Wyandot	.50

BOSTON CURB*	Nov. 5
Alaska Mines Corp.	.25
Bingham Mines	9⅛
Boston Ely	.45
Boston & Mont.	.50
Butte & Lon'n Dev.	.10
Calaveras	2
Calumet-Corbin	‡.01
Chief Con.	2
Cortez	.10
Crown Reserve	.23
Crystal Cop.	.60
Eagle & Blue Bell	2
Gila Copper	17
Houghton Copper	.70
Intermountain	1⅛
Iron Cap, Com.	14
Iron Cap Cop., pf.	14
Mexican Metals	.26
Mines of America	1½
Mojave Tungsten	.30
Nat. Zinc & Lead	.27
Nevada-Douglas	1½
New Baltic	.75
New Cornelia	13½
Oneco	.25
Pacific Mines	.35
Rex Cons.	.10

SALT LAKE*	Nov. 5
Bannack	.26
Big Four	.01
Cardiff	2.65
Colorado Mining	.13
Daly	1.40
Daly-Judge	8.25
Empire Copper	1.27½
Gold Chain	16½
Grand Central	.54
Iron Blossom	.55
Lower Mammoth	‡.03
May Day	.04
Moscow	.11
Prince Con.	.80
Rico Wellington	.18
Silver-King Coal'n	2.90
Silver King Con.	3.50
Sioux Con.	.04
So. Hecla	.94
Tintic Standard	1.45
Uncle Sam	.02
Wilbert	.21
Yankee	.03

TORONTO*	Nov. 5
Adanac	.14
Bailey	.05
Beaver Con.	.33
Chambers Ferland	.12
Coniagas	2.90
Hargraves	.08
La Rose	37½
Peterson Lake	.08
Temiskaming	.26
Wettlaufer-Lor.	.05½
Davidson	.34
Dome Exten.	.10
Dome Lake	.15
Hollinger	4.60
McIntyre	1.33
Newray	.43
Porcu. Crown	.30
Teck-Hughes	.40
Vipond	.20½
West Dome	.17

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Nov. 5
Cresson Con.	4.50
Doctor Jack Pot.	.03½
Elkton Con.	.02
El Paso	.15
Gold Sovereign	.02½
Golden Cycle	1.70
Granite	.30
Isabella	.07½
Mary McKinney	.06
Portland	1.00
United Gold M.	.15
Vindicator	.27

LONDON	Oct. 22
Alaska Mexican	‡£0 5s 0d
Alaska Tre'dwell	‡ 1 0 0
Burma Corp.	4 1 3
Cam & Motor	0 12 6
Camp Bird	0 8 6
El Oro	0 10 6
Esperanza	0 9 0
Mexican Mines	5 18 9
Nechi, pfd.	0 13 0
Oroville	0 18 3
Santa Gert'dis.	0 14 6
Tomboy	0 18 6

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
Jan.	48.855	56.775	75.630	22.731	26.960	36.682
Feb.	48.477	56.755	77.585	22.753	26.975	37.742
Mar.	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
Aug.	47.163	66.083	85.407	22.780	31.498	43.418
Sept.	48.680	68.515	100.740	23.591	32.584	50.920
Oct.	49.385	67.855	87.332	23.925	32.361	44.324
Nov.	51.714	71.604		25.094	34.192	
Dec.	54.971	75.765		26.373	36.410	
Year	49.684	65.661		23.675	31.315	

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.759	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug.	26.120	25.380	110.283	122.391	126.304	137.000
Sept.	26.855	25.073	113.905	117.500	134.071	135.250
Oct.	27.193	23.500	122.750	110.000	142.523	125.000
Nov.	30.625		134.659		155.432	
Dec.	31.890		145.316		162.842	
Year	27.202		116.059		138.281	

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565	62.681	169.870	243.978
September	38.830	61.542	171.345	244.038
October	41.241	61.851	179.307	247.467
November	44.109		186.932	
December	42.635		183.368	
Av. year	43.480		182.096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810	8.680	6.699	8.611	30.786	30.500
October	7.000	6.710	6.898	6.650	30.716	30.500
November	7.042		6.945		30.500	
December	7.513		7.405		30.500	
Year	6.853		6.777		31.359	

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan.	16.915	9.619	16.745	9.449	89.810	48.329
Feb.	18.420	10.045	18.260	9.875	97.762	47.000
Mar.	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug.	8.730	8.360	8.560	8.190	51.587	54.000
Sept.	8.990	8.136	8.820	7.966	52.095	54.000
Oct.	9.829	7.983	9.659	7.813	54.159	54.000
Nov.	11.592		11.422		56.023	
Dec.	10.665		10.495		55.842	
Year	12.804		12.634		72.071	

New York and St. Louis quotations, cents per pound, London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.94	19.58	43.06
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.80	19.20	53.95
August	21.95	54.17	18.95	50.37	19.22	53.95
September	22.88	46.40	19.58	42.24	19.53	48.58
October	24.61	37.25	21.26	33.95	21.51	33.95
November	30.07		28.18		26.55	
December	35.16		30.95		30.79	
Year	$23.88		$20.98		$21.15	

‡ As reported by W. P. Snyder & Co.

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Lots, Pittsburgh	St. Louis	Chicago	San Francisco	New York Nov. 5, 1917	New York One Yr. Ago
No. 10	6.00	8.05	8.00	11.00	10.00	4.25
No. 12	6.05	8.10	8.05	11.05	10.05	4.30
No. 14	6.10	8.15	8.10	11.10	10.10	4.35
Black						
Nos. 18 and 20	5.80	9.35	8.30	10.30	9.30	3.80
Nos. 22 and 24	5.85	9.40	8.35	10.85	9.35	3.85
No. 26	5.90	9.45	8.40	10.90	9.40	3.90
No. 27	5.95	9.50	8.45	10.95	9.45	3.95
No. 28	6.00	9.55	8.50	11.00	9.50	4.00
Galvanized						
No. 10	6.50	8.35	8.70	....	10.80	....
No. 12	6.60	8.50	8.70	11.40	10.90	4.50
No. 14	6.60	8.65	8.70	11.40	10.90	4.50
Nos. 18 and 20	6.90	8.95	9.00	11.70	11.25	4.90
Nos. 22 and 24	7.05	9.10	9.15	11.85	10.55	5.30
No. 26	7.20	9.25	9.20	12.00	10.70	5.45
No. 28	7.50	9.55	9.50	12.30	11.00	5.75

STEEL RAILS—The following quotations are per 100 lb. f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Nov. 5, 1917	Pittsburgh One Year Ago	Chicago* Nov. 5, 1917	Chicago* One Year Ago
Standard bessemer rails	$38.00	$33.00	$38.00	$33.00
Standard openhearth rails	40.00	35.00	40.00	35.00
Light rails, 8 to 10 lb.	83.00	50.00	83.00	43.00
Light rails, 12 to 14 lb.	82.00	49.00	82.00	42.00
Light rails, 25 to 45 lb.	75.00	47.00	75.00	40.00

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Nov. 5, 1917	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, $\frac{5}{8}$-in. and larger	$5.00 to 7.00	$2.65	$5.00	$6.45	$7.25*
Track bolts	7.00 to 8.00	3.25	6.25 Premium		8.80*
Standard section angle bars	3.50	2.00	4.50 Premium		4.65*

*Per 100 lb.

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Pittsburgh	New York Nov. 5, 1917	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$3.00	$5.25	$3.85	$5.05	$5.00	$7.75	$6.00
Channels, 3 to 15 in.	3.00	5.25	3.25	5.05	5.00	7.75	6.00
Angles, 3 to 6 in., ¼ in. thick	3.00	5.25	3.25	5.05	5.00	7.75	6.00
Tees, 3 in. and larger	3.00	5.30	3.40	5.05	5.05	7.75	6.00
Plates	3.25	10.00	4.00	7.05	7.00	10.50	9.00

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill, Pittsburgh	Warehouse New York Nov. 5, 1917	Warehouse New York One Year Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
¾ in. and larger	$5.25	$7.00	$5.25	$5.50	$5.55	$7.15	$8.40
CONE HEAD BOILER							
¾ in. and larger	5.35	7.10	5.35	5.60	5.65	7.25	8.50
⅝ and ⅞	5.50	7.25	5.50	5.75	5.80	7.40	8.65
½ and ⅞	5.85	7.60	5.85	6.10	6.15	7.75	9.00

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill, Pittsburgh	Chicago	St. Louis	Denver	Birmingham
Straight	$4.75	$7.00	$5.50	$7.75	$6.25
Assorted	4.90	7.00–7.50	5.75	8.00	6.50

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Nov. 1, 1917	One Month Ago	One Year Ago
$4.00 to $5.00	$4.50 to $5.00	$2.60 to $2.70

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York	St. Louis	Chicago	San Francisco
Galvanized	10—2½ %	10—2½ %	10—2½ %	List
Bright	20—2½ %	20—2½ %	20—2½ %	15%

SWEDISH (NORWAY) IRON—This material per 100 lb. sells as follows:

	Nov. 5, 1917	One Year Ago
New York	$14.00	$6.00
Cleveland	15.00	6.30
Chicago	13.50	5.50

In coils an advance of 50c. usually is charged:
Note—Stock scarce generally.

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing card in effect July 2, 1917, for iron, and May 1 for steel:

BUTT WELD

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
¼ to 3	49%	35½ %	¼ to 1½	33%	17%
LAP WELD					
2	42%	29½ %	2	26%	12%
2½ to 6	45%	32½ %	2½ to 4	28%	15%
7 to 12	42%	28½ %	4½ to 6	28%	15%
13 and 14	32½ %	....	7 to 12	25%	12%
15	30%	....			
BUTT WELD, EXTRA STRONG PLAIN ENDS					
¼ to 1½	47%	34½ %	¼ to 1½	33%	18%
2 to 3	48%	35½ %			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	40%	28½ %	2	27%	14%
2¼ to 4	43%	31½ %	2½ to 4	29%	17%
4½ to 6	42%	30½ %	4½ to 6	28%	16%
7 to 8	38%	24½ %	7 to 8	20%	8%
9 to 12	33%	19½ %	9 to 12	15%	3%

From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Chicago	Black St. Louis
¾ to 3 in. butt welded	38%	42%	34.27%
3½ to 6 in. lap welded	18%	38%	21.27%
7 to 12 in. lap welded	10%	35%	21.27%
	Galvanized New York	**Galvanized Chicago**	**Galvanized St. Louis**
¾ to 3 in. butt welded	22%	22%	19.27%
3½ to 6 in. lap welded	List	18%	13.27%
7 to 12 in. lap welded	List+20%	20%	6.27%

Malleable fittings, Class B and C, from New York stock sell at 5 and 5% from list prices. Cast iron, standard sizes, 34 and 5%.

MISCELLANEOUS

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels:

	New York	Chicago	Denver In Bbl. Lots	Denver In Carload Lots
Pure steam-distilled pine oil	$0.50½	$0.45	$0.30	$0.27
Pure destructively distilled pine oil	.40	.43	.30	....
Pine tar oil	.28½	.30	.24½	.19
Crude turpentine	.37	.47	.44	.38
Hardwood creosote	.19½*	.....	.34½	.31

*F.o.b. Cadillac, Mich.

SODIUM CYANIDE—New York price is 37c. per lb.; Denver, 44c.; in Chicago, 65c.

SODIUM SULPHIDE—In New York the price per pound is 4c. to 4¼c. for concentrated, 2¼c. to 2½c. for crystals. The Denver price for concentrated is quoted at 3½c. The Chicago price is 3½c. Concentrated comes in 500-lb. drums, the crystals in 400-lb. barrels.

ZINC DUST—New York price is 18c. per lb. in 1600-lb. barrel; Chicago, 18c.; in Denver, 18c.; in Chicago, 20c.

CALCIUM CARBIDE—Price f.o.b. cars at warehouse points east of Mississippi River (except in Alabama, Georgia and Florida) is $97.50 for Cameo, $102.50 for Union miners' carbide. In territory between Mississippi River and the Rockies and in Alabama, Georgia and Florida, add $5; west of Rockies, add $10 to $15.

LINOLEUM—In 50-sq.yd. rolls in carload lots the price is 88c. per square yard, for concentrating tables.

HOSE—

Fire

	50-Ft. Lengths
Underwriters' 2½-in.	70c. per ft.
Common, 2½-in.	40–10%

Air

	First Grade	Second Grade	Third Grade
¾-in. per ft.	$0.55	$0.30	$0.25

Steam—Discounts from list

First grade... 30% Second grade... 30-5% Third grade... 40-10%

RUBBER BELTING—The following discounts from list apply to transmission rubber and duck belting:

Competition 50–10% Best grade 25%
Standard 40%

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	40%	35%
St. Louis	45%	40%
Chicago	30+10%	40+5%
Birmingham	35%	35%
Denver	40%	35%

RAWHIDE LACING—40%.

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅜-in., 8 ft.; ½-in., 6; ⅝-in., 4½; 1-in., 3½; 1¼-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ¾-in. and larger, in 1200-ft. coils:

Boston	$0.35½	Kansas City	$0.33½
New York	.34	Los Angeles	.33½
Chicago	.32½	Seattle	.33½
Denver	.35½	San Francisco	.31

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.77
Asbestos for high-pressure steam	1.54
Duck and rubber for piston packing	.88
Flax, regular	.66
Flax, waterproofed	.99
Compressed asbestos sheet	.99
Wire insertion asbestos sheet	1.21
Rubber sheet	.55
Rubber sheet, wire insertion	.88
Rubber sheet, duck insertion	.44
Rubber sheet, cloth insertion	.25
Asbestos packing, twisted or braided, and graphited, for valve stems and stuffing boxes	1.10
Asbestos wick, ½- and 1-lb. balls	.65 to .70

FIRE BRICK—Quotations on the different kinds in the cities named are as follows, f.o.b. works:

	New York	Chicago
Silica brick, per 1000	$50.00 to 55.00	$55.00 to 60.00
Fire clay brick, per 1000, No. 1	45.00 to 55.00	.....
Magnesite brick, per net ton	135.00 to 145.00	.....
Chrome brick, per net ton	135.00	.....
Deadburned magnesite brick, per net ton	85.00 to 90.00	.....
Special furnace chrome brick, per net ton	60.00 to 70.00	60.00 to 80.00

Standard size fire brick, 9 x 4½ x 2½ in. The second quality is $4 to $5 cheaper per 1000.
St. Louis—High grade, $55 to $65; St. Louis grade, $40 to $50.
Birmingham—Fire clay, $25 to $30; Denver, $23, per 1000.

RAILWAY TIES—For fair-size orders, the following prices per tie hold:

	Material	7 in. x 9 in. by 8 Ft. 6 In.	6 in. x 8 in. by 8 Ft.
New York	Yellow Pine	$1.30	$1.06 to 1.11
St. Louis	Plain No. 1 White Oak	1.00	.75
Chicago	White Oak	.97	.82
Chicago	Creosoted	1.30	1.15
San Francisco	Green	1.08	.77
San Francisco	Creosoted	1.97	1.49

GREASES—Prices are as follows in the following cities in cents per pound for barrel lots:

	New York	Denver	Chicago	Birmingham	St. Louis
Cup	5 to 7	9½	7½	5½	5.6
Fiber or sponge	5 to 7	15	7¾	12½	5.9
Transmission	5 to 7	13	6¼	12½	5.9
Axle	3 to 7	5	5	4½	3.3
Gear	4 to 5	4½	6½	10½	6
Car journal	5½ to 7¼	4	6	9	3.75

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Nov. 5, 1917	One Year Ago		
White	11.00 to 13.00	10.00 to 12.00	16.00	14.00 to 15.00
Colored mixed	8.50 to 12.00	7.00 to 9.00	14.00	10.00 to 12.00

WIPING CLOTHS—In Cleveland the jobbers' price per 1000 is as follows:

13¼ x 13¼ ..... $35.00 13¼ x 20½ $45.00

In Chicago they sell at $30 to $33 per 1000.

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Nov. 5, 1917	One Year Ago	Nov. 5, 1917	One Year Ago	Nov. 5, 1917	One Year Ago
Raw in barrels	$1.16	$0.88	$1.15	$0.97	$1.17	$0.92
5-gal. cans	1.26	.98	1.25	1.07	1.27	1.02

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red				White	
	Nov. 5, 1917		1 Year Ago		Nov. 5, 1917	1 Yr. Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg	12.25	12.50	10.50	11.00	12.00	10.50
25- and 50-lb. kegs	12.50	12.75	10.75	11.25	12.25	10.75
12½-lb. keg	12.75	13.00	11.00	11.50	12.50	11.00
1- to 5-lb. cans	14.25	14.50	12.50	12.50	14.50	12.50

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago		
	Nov. 5, 1917	One Year Ago	Nov. 5, 1917	One Year Ago	Nov. 5, 1917	One Year Ago	St. Louis, Nov. 5, 1917
Hot pressed square	List	$1.50	$1.30	$3.00	$2.00	$3.00	$1.60
Hot pressed hexagon	List	1.50	1.20	3.00	2.00	3.00	1.60
Cold punched square	List	1.00	List	2.00	1.50	2.00	1.00
Cold punched hexagon	List	1.50	List	2.75	1.50	2.75	1.00

Semifinished nuts sell at the following discounts from list price:

	Nov. 5, 1917	One Year Ago
New York	50%	50—10%
Cleveland	45%	50—10%
Chicago	50%	50—10%
St. Louis	40%	....

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago	St. Louis
¾ by 4 in. and smaller	30%	35—5%	40—10%	35%
Larger and longer up to 1 in. by 30 in.	15%	25—5%	35—5%	25—5%

WROUGHT WASHERS—From warehouses at the places named the following amount is deducted from list price:

New York..$1.00 Cleveland..$3.50 Chicago..$4.00 St. Louis..$2.25

For cast-iron washers the base price per 100 lb. is as follows:

New York..$5.00 Cleveland..$5.50 Chicago..$3.50 St. Louis..$2.75

EXPLOSIVES—Price per pound in small lots at cities named:

	Low Freezing	Gelatin			Black
	20%	40%	60%	80%	Powder
New York	.....	$0.27½	$0.34½	.....	$2.50*
Boston	.....	.....	.36½	$0.43¾	....
Kansas City	$0.20	.26¼	.33¼	.43¼	....
Los Angeles	.20	.27	.35	.....	....
Seattle	.18½	.24¾	.31¾	.41¾	....
Chicago	.19¾	.23¾	.33	.43	2.45*
St. Paul	.20	.26¼	.33¼	.....	2.55*
St. Louis	.16½	.20½	.29½	.39½	2.15*
Denver	.19	.25¼	.32¼	.42¼	....
Dallas	.25	.39	.39	.49	....

*25-lb. bags.

FUEL OIL—Price variable, depending upon stock. New York quotations not available owing to this fact. In Chicago and St. Louis the following prices are quoted:

	Chicago	St. Louis
Domestic light, 22-26 Baumé	5¼c.	4½—4¾c.
Mexican heavy, 12-14 Baumé	7c.	3½c.

Note—There is practically no fuel oil in Chicago at present time.

OIL—Price per 50-gal. bbl. is as follows:

City	Fuel	Black	Red Engine	Steam Cylinder	Gasoline
Seattle	$1.60	$6.25	$11.00	$21.00	$10.25
Los Angeles	1.45	6.50	12.00	26.00	10.00
Denver	3.25	8.75	17.00	24.00	12.00
*St. Paul	3.00	5.50	11.00	17.50	10.05
Boston	5.50	10.50	15.00	20.00	12.50
Kansas City	7.20	5.20	10 50	17.85	10.15

Note—Standard prices of oil are necessarily difficult to give Those above are for average grades.
*These are last month's quotations; current prices not available.

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tar felt (14 lb. per square of 100 sq.ft.)	$61.00	$62.00
Tar pitch (in 400-lb. bbl.)	15.00	16.50
Asphalt pitch (in barrels)	29.00	30.50
Asphalt felt	60.00	62.00

PREPARED ROOFINGS—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply		2-Ply		3-Ply	
	c.l.	l.cl.	c.l.	l.cl.	c.l.	l.cl.
No. 1 grade	$1.15	$1.40	$1.45	$1.60	$1.75	$1.90
No. 2 grade	1.10	1.25	1.25	1.40	1.50	1.65

Asbestos asphalt saturated felt (14 lb. per square) costs $5.35 per 100 lb.
Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.85 per roll in carload lots and $2.10 for smaller quantities.
Shingles, red and green slate finish, cost $4.75 per square in carloads, $5 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4x12x12	8x12x12	12x12x12
Boston	$0.0957	$0.171	$0.2266
Kansas City*	.0595	.1125	.1575
Denver	.09	.17	.25
New Orleans	.0892	.1417	.1863
Los Angeles*	.05	.10	.165
Chicago	.07	.135	...

*In quantities of 1000.

LUMBER—Price per M in carload lots:

	8 x 8-in. x 20 Ft. and Under				12 x 12-In., 20 Ft. and Under	
	Y.P.	Fir	Hemlock	Spruce	Y.P.	Fir
Kansas City	$41.00	$33.00	$33.00	....	$47.00	$33.00
Seattle	21.00	21.00	21.00	$21.00	21.00	21.00
Denver	....	30.00	....	27.50	....	32.00
San Francisco	....	24.00	24.00	....	....	24.00
St. Paul	....	38.00	31.50	....	....	43.00

Note—Boston lumber market demoralized.

	1-In. Rough, 10 In. x 16 Ft. and Under			2-In. T. and G. 10 In. x 16 Ft.	
	Y.P.	Fir	Hemlock	Y.P.	Fir
Kansas City	$42.00	$42.50	$41.00	$50.00	....
Seattle	21.00	21.00	21.00	21.00	$21.00
Los Angeles	....	30.00	30.00	....	....
Denver	....	30.00	30.00	....	30.00
San Francisco	....	24.00	24.00	....	24.00
St. Paul	....	51.00	34.00	59.00	37.50

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	Nov. 5, 1917	One Month Ago	One Year Ago
New York	$2.22	$2.22	$1.72
Jersey City	2.16	2.16	1.60
Boston	2.77	2.77	1.92
Chicago	2.21	2.31	1.86
Pittsburgh	2.31	2.31	1.81
Cleveland	2.44	2.44	1.94
Denver	3.20	3.20	...
Los Angeles	2.30	2.40	...

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$16.50	$13.25	$2.10	$1.90
Chicago	15.00	12.00	1.90	....
St. Louis	12.00	10.75	....	....
Dallas	20.00	15.00	....	....
San Francisco	18.00	....	1.65	....